

The inside cover & the front pages DR. 1 thru DR. 10 covers the basics...

Find the answers to your questions here... If you still need help, give us a call!





The Portals™Service Menu, Section 3, is your Technical Friend...



Richard Childress: ®RCR / ®Kevin Harvick Inc. / ®GM. The "Motorcraft" trademarks, Wood Brothers Racing, Ricky Rudd's name and / or likeness used by authority of Roush Racing, Livonia, MI. Miller Brewing Company: MILLER LITE & LITE are registered trademarks of Miller Brewing Co., used under license. RWI Productions, LLC:
® Rusty Wallace, Inc.



Backglass Film is available if the Miller Lite Logo is not appropriate for your location

(see Page 61 for Part Numbers)

NASCAR® Pinball © 2005 Stern® Pinball, Inc. PLD® Pat Lawlor Design, Inc. All Rights Reserved. NASCAR® is a registered trademark of the National Association for Stock Car Auto Racing, Inc.



Joe Blackwell DIRECTOR. Parts Sales & **Technical Support**



Patty Schraps

Stock Room SUPERVISOR



Dorothy Brown

Parts Sales REPRESENTATIVE

Your Parts Sales & Technical Support Team



Chas Siddiqi

Technical Support **ENGINEER**



Patrick Powers

Technical Support **ENGINEER**



J. Alfer **Technical Support** Documentation **ADMINISTRATOR**

Pinball Service Game Manual

Please call, eMail or visit us online for technical support, questions or comments regarding this pinball game.

click Tech. Support & Parts Sales



Once there, you will find Service Bulletins, ROM Code, Parts, Appendixes, Coin Cards, helpful information and much more!

Stern® Pinball, Inc. All Rights Reserved. Printed in the U.S.A. July 2005

SPI Part Number 780-5086-00

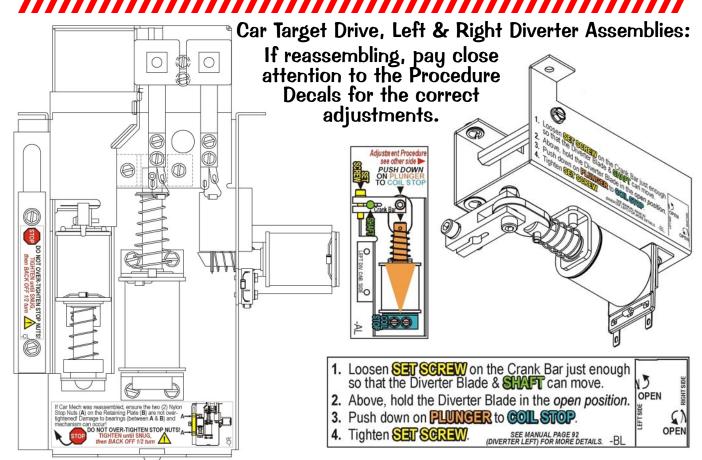
• Toll-Free: 1-800-KICKERS (542-5377) Or 1-708-345-7700 • eMail: parts.service@sternpinball.com •

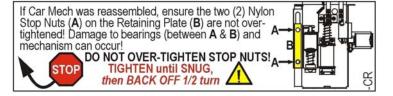


For Proper Operation of this Pinball Game, (4) Pinballs must be installed in the Ball Trough!

,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

MASGAR.





More details on these assemblies in the BLUE PAGES. See Section 4, Chapter 2, Drawings for Major Assemblies & Ramps, Diverter (Left & Right) ... Parts, Pages 92-93 & Car Target Drive ... Parts, Pages 98-99



Exiting Portals™ or turning game on/off will start the Power-Up Routine. Upon Power-Up, HOLD IN THE RIGHT FLIPPER BUTTON to view the CPU Game & Display Code Versions (+ Check-Sums), followed by the Location & Game ID Numbers and Alerts, if any (see Sec. 3, Chp. 2, GO TO DIAGNOSTICS MENU, Technician Alerts).





Look over the TOURNAMENT MENU in Portals[™]! Read over Section 3, Chapter 7, Pages 53-57.



An Optional Tournament Kit is required for this ToPS™ Ready Pinball Game.
You can now easily set-up, start and end Tournaments for cash, tokens, tickets or points!

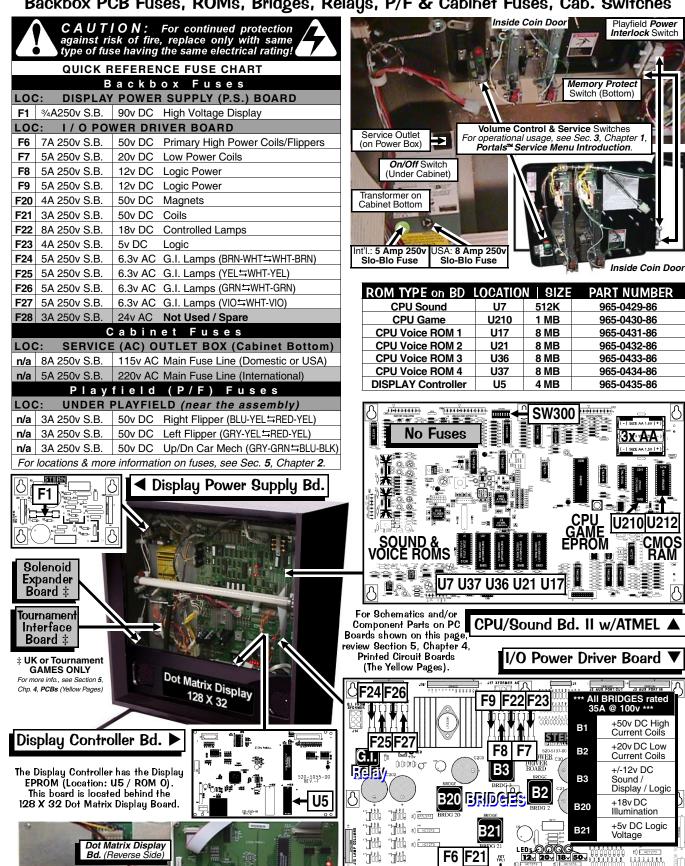






New to our Pinball Games?

Backbox PCB Fuses, ROMs, Bridges, Relays, P/F & Cabinet Fuses, Cab. Switches





No Fuses

DISPLAY EPROM U5 / ROM 0

U5



F28 F20

FIND-IT-IN-FRONT: Dr. Pinball Section Explained

The key technical data from various parts of the manual were extracted and combined into the "Find- It-In-Front: Dr. Pinball Section." This section (pages DR. ● - ●) will assist the technician in locating important technical information needed to troubleshoot the Pinball Machine. Dr. Pinball is also available in a Flow Chart Help Format in the Game Display. To access, enter the **Portals**™ **Service Menu**.

How It Works

First, the operator / technician must enter the Service Menu Mode (for a complete description of the Portals™ Service Menu and ICONS Read! Section 3, Chapter 1). To get into the Service Menu Mode, power-up the game (if not already) and open the Coin Door. On the Coin Door is the Portals Service Switch Set (Red, Green & Black Buttons).

Step 1: Push down the Black "BEGIN TEST" Button. Looking at the Video Display you will momentarily see the introductory screen followed by the MAIN MENU.

Step 2: Move through the Menus by pushing the Red "LEFT" or Green "RIGHT" Buttons.

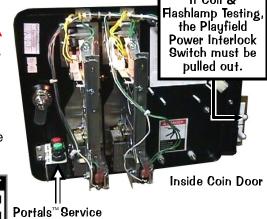


Step 3: Select or activate the *Icons* by pushing the **Black** "ENTER" Button.

While in the Portals[™] Service Menu, the Start Button can be used in lieu of the Black Button; the Left & Right Flipper Buttons can be used in lieu of the Red & Green Buttons. However, in Switch or Active Switch Tests only the Red & Green Buttons can be used.

In our **Portals**™ **Service Menu**, selecting the "DR." *Icon* will bring the operator/technician into DR. PINBALL (Flow Chart Menus), the "on-screen" diagnostic aide. This is a feature that will allow you to utilize the power of the microprocessor assisting in troubleshooting a problem with the

machine in a Flow Chart format (follow the questions & answer by using the Mini-Icons in the display).







After entering **Portals**™, the **MAIN MENU** now appears with the "DIAG" *Icon* (**GO TO DIAGNOSTICS MENU**) flashing; press the Black "ENTER" Button to activate this ICON. The DIAGNOS-TICS MENU now appears with the "SW" *lcon* (GO TO SWITCH MENU) flashing; use the Red "LEFT" or Green "RIGHT" Buttons, until the "DR." Icon (DR. PINBALL) is flashing:



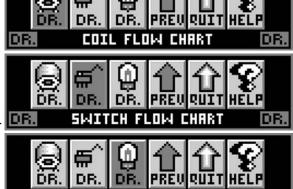


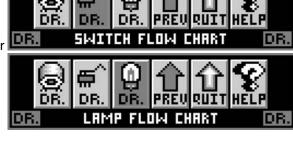
follow, such as "Does the lamp turn on?" or "Check bridge rectifier BR-20, if short replace." When Dr. Pinball displays a question or requests a procedure, Dr. Pinball will expect a response such as "NO" or "YES". You the operator/technician must respond by using the Red or Green Buttons to "SELECT" a Mini-Icon and the Black Button to "ACTIVATE or ENTER" your selection.

For Mini-Icons explanations & details, see the end of Section 3. Chapter 2, GO TO DIAGNOSTICS MENU, Dr. Pinball.

Press the Black "ENTER" Button to activate this ICON. The DR. PINBALL MENU (Flow Chart Menus) now appears with the COIL "DR." *Icon* flashing. Three (3) *Icons*, Coil "DR.", Switch "DR." and Lamp "DR." are available for selection. Selecting a particular *İcon* will give you a choice of which specific Coil (Solenoid), Switch or Lamp Circuit needs to be

diagnosed. After selection. Dr. Pinball will now display a question or a procedure to





OPEN THE DOOR

If this *display flashes*, the game is indicating that **CMOS RAM** memory (*CPU Loc. U212*) has been corrupted. This is caused be either failure in memory (*e.g. batteries are dead and/or faulty RAM*) or upon installation of updated version of game code. Opening the **Coin Door** will initiate a *Factory Restore* (*Reset*), by opening the *Memory Protect Switch*. Check battery voltage

at VBATT Test Point on the CPU/Sound Bd. (moré details in Section 5, Chapter 4, PCBs).

DIAGNOSTIC AIDS

OPERATOR ALERT! #2 AUTO LAUNCH COIL MALFUNCTION

This *display* is shown momentarily during **Game Mode** or **Power-Up** to alert the operator of a coil malfunction (*coil doesn't energize or coil fires a multiple number of times*). **OPERATOR ALERT!** works by monitoring any *switch activated coil* that has the potential to trap a ball when disabled (*e.g. in the Auto Launch, Scoop, Eject, etc.*). This alert can also appear

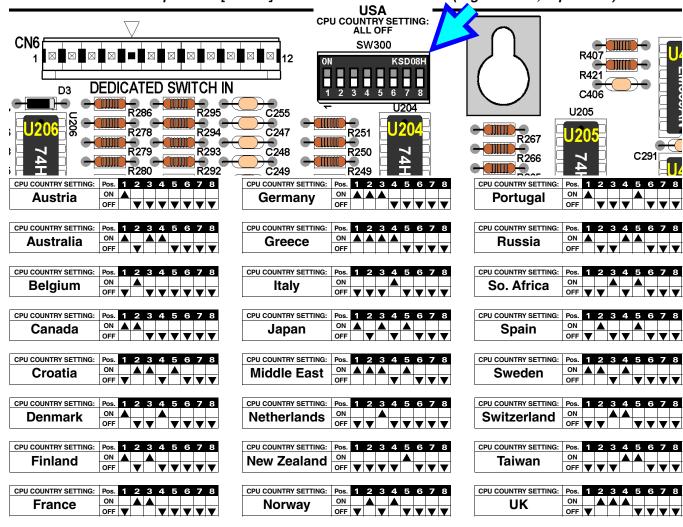
if a switch associated with a coil (e.g. #16 Shooter Lane & #2 Auto Launch) is stuck closed (caused by a switch jam or stuck ball); the CPU/Sound Board will activate the coil approximately ten times and if the switch remains closed, the game will report this switch in Technician Alerts & will indicate the following display warning:

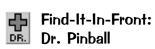
PLEASE CHECK TECH REPORT PORTALS->DIAG->TECH

If this **Tech Report Alert flashes** (along with an audible sound), the game has detected faulty switches and/or missing pinballs. Select the "TECH" *Icon* for information (review **Technician Alerts**, **Pages 24-25**). For this **Alert display** to appear, Standard Adj. **49**, **must be changed** to **POWERUP**, **COIN DOOR** or **POWERUP AND COIN DOOR**, the default is

NEVER (review Section 3, Chp. 4, GO TO ADJUSTMENTS MENU, Standard Adjustments, Page 44).

Location of Dip Switch [SW300] is on the CPU/Sound Board (Right of CN6, Top Middle)







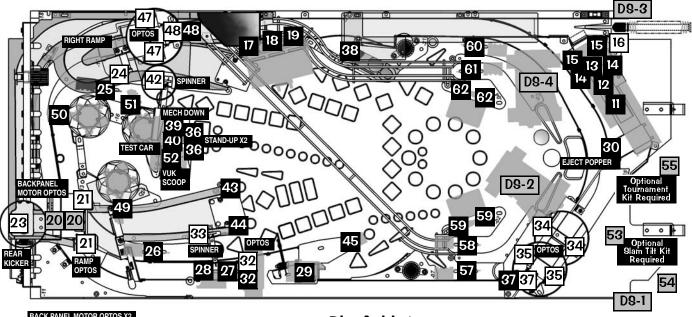


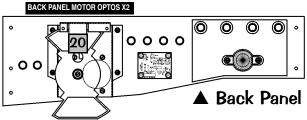




SWITCH MATRIX GRID, DEDICATED SWITCHES & LOCATIONS

Column (Drive)	1: Q1	2: Q2	3: Q3	4: Q4	5: Q5	6: Q6	7: Q7	8: Q8	GROUND	GROUND
Row (Refurn)	GRN-BRN CN5-P1	GRN-RED CN5-P3	GRN-ORG CN5-P4	GRN-YEL CN5-P5	GRN-BLK CN5-P6	GRN-BLU CN5-P7	GRN-VIO CN5-P8	GRN-GRY CN5-P9	IC U206 INPUTS	BLK CN6-P1, -P11
1H U400	1 Cabinet Side	9		25 Below P/F	38 Above P/F	41	49 Below P/F	Below P/F	1: U206	DS-1 on Cabinet Side
WHT-BRN CN7-P9	BUTTON (UK ONLY)	NOT USED	TOP DROP TARGET	RIGHT ORBIT	LEFT SPINNER	NOT USED	LEFT BUMPER	LEFT OUTLANE	GRY-BRN CN6-P2	#1 LEFT FLIPPER BUTTON
Sw. Part Number:	180-5160-01		180-5158-00	500-6227-02	180-5010-04		180-5015-04	500-6227-01	Sw. Part Number:	180-5160-01
2: U400	Coin Door 4TH	10		26 Below P/F	34 Above P/F LOWER		50 Below P/F	58 Below P/F	2: U206	DS-2 Below Playfield
WHT-RED CN7-P8	COIN SLOT	NOT USED	DROP TARGET S	LEFT ORBIT	ACCELERATOR RIGHT (OPTO)	RIGHT SPINNER	RIGHT BUMPER	LEFT RETURN LANE	GRY-RED CN6-P3	#2 LEFT FLIPPER E.O.S (End-of-Stroke)
Sw. Part Number:	180-5204-00	11 Below P/F	180-5158-00	500-6227-02 27 Below P/F	See Sw. 34 Note	180-5010-04	180-5015-04	500-6227-02	Sw. Part Number:	
3: U400	Coin Door 6TH	Below P/F 4-BALL			35 Above P/F LOWER	43 Below P/F	51 Below P/F	59 Below P/F	3: U206	on Cabinet Side
WHT-ORG CN7-P7	COIN SLOT	TROUGH #1 (LEFT)	BOTTOM DROP TARGET	PIT LOCK MIDDLE	ACCELERATOR MID. (OPTO)	RIGHT STANDUP	BOTTOM BUMPER	LEFT SLINGSHOT	GRY-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON
Sw. Part Number:	Future Use	180-5119-02	180-5158-00	180-5179-00	See Sw. 35 Note	500-5857-06	180-5015-04	180-5054-00 (x2)	Sw. Part Number:	180-5160-01
4: U400	4 Coin Door RIGHT		20 Above P/F WINDMILL	28 Below P/F	36 Below P/F TEST CAR	44 Below P/F	52 Below P/F	60 Below P/F	4: U206	DS-4 Below Playfield
WHT-YEL CN7-P6	COIN	4-BALL TROUGH #2	MOTOR OPTO	PIT LOCK TOP	STANDUP X2	CENTER STANDUP	GARAGE VUK	RIGHT OUTLANE	GRY-YEL CN6-P6	#4 RIGHT FLIPPER E.O.S. (End-of-Stroke)
Sw. Part Number:	180-5204-00	180-5119-02	See Sw. 20 Note	180-5178-00	515-5162-06	500-5857-06	180-5116-01	500-6227-02	Sw. Part Number:	180-5149-00 on Flipper
5: U401		13 Below P/F	21 Backpanel	29 Below P/F	37 Above/Below	45 Below P/F		61 Below P/F	5: U206	DS-5
WHT-GRN CN7-P5	CENTER COIN SLOT / DBA	4-BALL TROUGH #3	LEFT RAMP MAKE OPTO	MIDWAY OF EJECT		LEFT STANDUP	SLAM TILT (OPT)	RIGHT RETURN LANE	GRY-GRN CN6-P7	NOT USED
Sw. Part Number:	180-5204-00	180-5119-02	See Sw. 21 Note	180-5116-01	See Sw. 37 Note	500-5857-06	180-	500-6227-01	Sw. Part Number:	
6: U401	6 Coin Door LEFT	14 Below P/F 4-BALL		30 Below P/F TRACK D	38 Below P/F CAPTIVE	46	54 In Cabinet	62 Below P/F	6: U206	DS-6 on Coin Door
WHT-BLU CN7-P3	COIN SLOT	TROUGH VUK OPTO	NOT USED	EXIT POPPER S	BALL STANDUP	NOT USED	START BUTTON	RIGHT SLINGSHOT	GRY-BLU CN6-P8	#6 VOLUME (RED BUTTON) (In Test: LEFT)
Sw. Part Number:	180-5204-00	See Sw. 14 Note		180-5116-01	500-5232-06		180-5174-00	180-5054-00 (x2)	Sw. Part Number:	180-5192-02
7: U401	7 Coin Door 5TH	15 Below P/F 4-BALL	23 Above P/F TRUCK	31	39 Below P/F CAR	47 Above P/F UPPER	55 In Cabinet	63	7: U206	DS-7 on Coin Door
WHT-VIO CN7-P2	COIN SLOT	STACKING OPTO	RAMP KICKER	NOT USED	MECH DOWN	ACCÉLERATOR TOP (OPTO)	MENT START	NOT USED	GRY-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT)
Sw. Part Number:	Future Use	See Sw. 15 Note	180-5057-00	20 About /Delaw	180-5201-00	See Sw. 47 Note	180-5174-00	CA	Sw. Part Number:	180-5192-04
8: U401	8 Cabinet Side		24 Above P/F RIGHT	32 Above/Below PIT LOCK	40 Below P/F	48 Above/Below UPPER		64	8: U206	DS-8 on Coin Door
WHT-GRY CN7-P1	RT BUTTON (UK ONLY)	SHOOTER LANE	RAMP (TO) DIVERTER	BOTTOM (OPTO)	TEST CAR	ACCÉLERATOR BOT. (OPTO)	PLUMB BOB TILT	NOT USED	GRY-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER)
Sw Part Number	180-5160-01	180-5200-00	180-5010-04	See Sw. 32 Note	180-5010-04	See Sw. 48 Note	See Sw. 56 Note		Sw. Part Number:	` 180-5192-00 ′





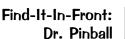
Playfield **A**

= Switches above Playfield. = Switches below Playfield.

= Switches not on Playfield.

Switch Part Notes: ¥ Yen Coin Switch is 180-5091-00. Part Numbers which start with 515- or 500- include the bracket, target, and/or housing. Switches 14, 15, 18, 23 & 24 Part Note: Transmitter & Receiver OPTO PC Boards are used as Switches: Transmitter: 515-0173-00 (Sw. 14 & 15); Receiver: 515-0174-00 (Sw. 14 & 15); Transceiver: 500-6775-00 (Qty. 2/per) (Sw. 20, 21, 32, 34, 35, 37, 47 & 48 see Pages 148-151 for more details) Sw. 56 Part Note: The Switch is comprised of a Hanger Bracket (535-5319-00) and Contact Wire (535-7563-01) located in the Cabinet. Some Switch Diodes may be located under the playfield, in the Cabinet or Backbox on Terminal Strips or Diode Boards and not on the assemblies. DOTS: Diode On Terminal Strip, see Sec. 5, Chp.2, Playfield Wiring









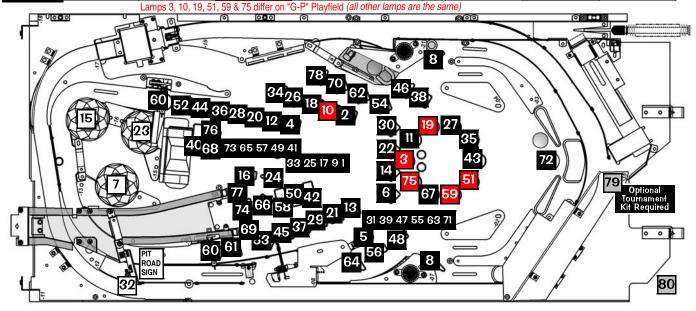




LAMP MENU: ONE, ALL, ROW & COLUMN

LAMP MATRIX GRID & LOCATIONS*

Column (18v)	1: U17	2: U16	3: U15	4: U14	5: U13	6: U12	7: U11	8: U10
Row (Ground)	YEL-BRN J13-P9	YEL-RED J13-P8	YEL-ORG J13-P7	YEL-BLK J13-P6	YEL-GRN J13-P5	YEL-BLU J13-P4	YEL-VIO J13-P3	YEL-GRY J13-P1
1: Q33	#44 Clear Bulb	2 #555 Clear Bulb	3 #555 Clear Bulb	4 #555 Clear Bulb	5 #555 Clear Bulb	6 #555 Clear Bulb	7 #555 White LED	8 #555 Clear Bulb
RED-BRN J12-P1	RACE POSITION 10	VICTORY LAP	HAPPY HOUR*	100K	STANDUP LEFT	(R)ACE	LEFT POP	SPECIAL & MILLIONS
2: Q34	9 #555 Clear Bulb	10 #555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	13 #555 Clear Bulb	14 #555 Clear Bulb	15 #555 White LED	#555 Clear Bulb
RED-BLK J12-P2	RACE POSITION 9	ROAD COURSE*	INFIELD PARTY	150K	100K	R(A)CE	RIGHT POP	GARAGE
3: Q35	17 #44 Clear Bulb	18 #555 Clear Bulb	19 #555 Clear Bulb	#555 Clear Bulb	21 #555 Clear Bulb	#555 Clear Bulb	23 #555 White LED	#555 Clear Bulb
RED-ORG J12-P3	RACE POSITION 8	2X HAULER MILES	SHORT TRACK*	200K	150K	RA(C)E	BOTTOM POP	FUEL
4: Q36	#555 Clear Bulb	#555 Clear Bulb	#44 Clear Bulb	28 #555 Clear Bulb	29 #555 Clear Bulb	30 #555 Clear Bulb	31 #44 Clear Bulb	#44 Yellow Bulb
RED-YEL J12-P4	RACE POSITION 7	COLLECT R-A-C-E	TEST CAR	250K	200K	RAC (E)	(C) HAMP #1	PIT ROAD SIGN
5: Q37	#44 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	37 #555 Clear Bulb	38 #555 Clear Bulb	39 #44 Clear Bulb	40 #44 Clear Bulb
RED-GRN J12-P5	RACE POSITION 6	JACK POT	HAULER RIDE	HARD RACING	250K	SPIN	C (H) AMP #1	MOVE UP
6: Q38	#555 Clear Bulb	42 #555 Clear Bulb	#555 Clear Bulb	44 #555 Clear Bulb	45 #555 Clear Bulb	46 #555 Clear Bulb	47 #44 Clear Bulb	48 #555 Clear Bulb
RED-BLU J12-P6	RACE POSITION 5	BONUS JACKPOT	LIGHT EXTRA BALL	COLLECT R-A-C-E	SPEED SHOTS	JACK POT	CH (A) MP #1	CHAMP #1
	49 #44 Clear Bulb	#555 Clear Bulb	51 #44 Clear Bulb	52 #555 Clear Bulb	53 #555 Clear Bulb	54 #555 Clear Bulb	55 #44 Clear Bulb	#555 Clear Bulb
RED-VIO J12-P8	RACE POSITION 4	MULTI BALL	BUMP 'N RUN*	JACK POT	COLLECT R-A-C-E	EXTRA BALL	CHA (M) P #1	SCANNER
8: Q40	#555 Clear Bulb	58 #555 Clear Bulb	59 #555 Clear Bulb	60 #44 Clear (X2)	61 #555 Clear Bulb	62 #555 Clear Bulb	63 #44 Clear Bulb	#555 Clear Bulb
RED-GRY J12-P9	RACE POSITION 3	LOCK	RIGHT SIDES ONLY*	SPINNERS X2 (@ MAX)	JACK POT	MODE BONUS	CHAM (P) #1	JACK POT
	#44 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	69 #555 Clear Bulb	70 #555 Clear Bulb	71 #44 Clear Bulb	72 #555 Clear Bulb
RED-WHT J12-P10	RACE POSITION 2	COLLECT R-A-C-E	SUPER FAN	2 TO GO	LEFT RAMP STANDUP (LEFT)	COLLECT R-A-C-E	CHAMP (#1)	SHOOT AGAIN
	#555 Clear Bulb	74 #555 Clear Bulb	75 #555 Clear Bulb	76 #555 Clear Bulb	77 #555 Clear Bulb	78 #555 Clear Bulb	79 OPTIONAL	#555 Clear Bulb
RED J12-P11	RACE POSITION 1	JACK POT	GAS 'N GO*	TO GO	LEFT RAMP STANDUP (RT)	SUPER JACK POT	TOURNAMENT BUTTON	START BUTTON



LAMPS ON BACK PANEL ARE G.I. ONLY. NO CONTROL LAMPS THIS GAME.

Playfield **A**

= Lamps which differ on "G-P" Playfield

(all other lamps are the same)

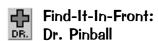
= Lamps above Playfield.

= Lamps below Playfield.

= Lamps not on Playfield.

Lamp Part Notes: #555 Wedge Base (W.B.) Bulb Clear = 165-5002-00. #44 Bayonet Bulb (Heavy Filament) Clear = 165-5000-44-HF. #555 LED Wedge Base White = 112-5024-08

See Section 4, Chapter 1, Parts Identification & Location, Pages 78-80 for more details on bulbs and corresponding sockets. Some Lamp Diodes may be located under the playfield, in the Cabinet or Backbox on Terminal Strips and not on or with the Lamp Socket. DOTS: Diode On Terminal Strip, see Sec. 5, Chp. 2, Playfield Wiring.











COILS DETAILED CHART TABLE

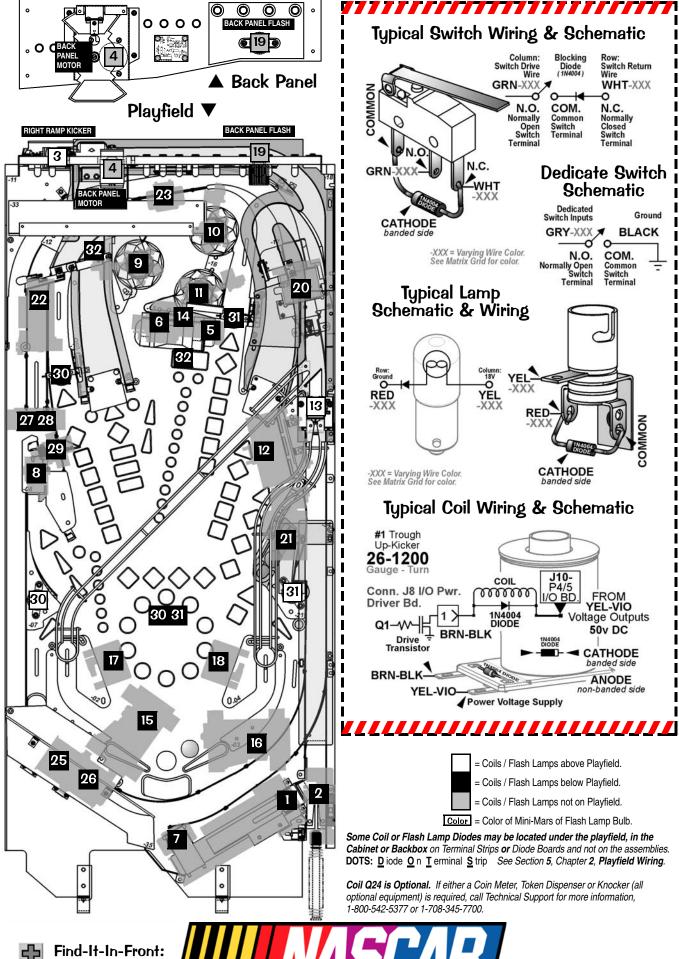
	High Current Coils Group 1	Drive	Driver Ouput Board	Power Line	Power Line	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
ш4	,	nsistor	Ouput Board	Color	Connection				or Bulb Type 26-1200 ひ
#1	TROUGH UP-KICKER	Q1		YEL-VIO	J10-P4/5	50v DC	BRN-BLK	J8-P1	090-5044-00T 24-940 O
#2	AUTO LAUNCH	Q2	A	YEL-VIO	J10-P4/5	50v DC	BRN-RED	J8-P3	090-5036-00B 23-800 U
#3	TRUCK RAMP KICKER	Q3	1/0	YEL-VIO	J10-P4/5	50 _v DC	BRN-ORG	J8-P4	090-5001-00B
#4	TRUCK MOTOR DRIVE (20V)	Q4	I/O Power	BROWN	J7-P1	20 _v DC	BRN-YEL	J8-P5	Motor 20v 041-5093-00
#5	GARAGE RELEASE	Q5	Driver	YEL-VIO	J10-P4/5	50 _v DC	BRN-GRN	J8-P6	23-800 O 090-5001-00T
#6	GARAGE KICKER	Q6	_	YEL-VIO	J10-P4/5	50v DC	BRN-BLU	J8-P7	23-800 U 090-5001-00T
#7	TRACK EXIT POPPER	Q7	•	YEL-VIO	J10-P4/5	50 _v DC	BRN-VIO	J8-P8	23-800 ひ 090-5001-00T
#8	MIDWAY EJECT	Q8		YEL-VIO	J10-P4/5	50v DC	BRN-GRY	J8-P9	26-1200 ひ 090-5044-00T
	High Current Coils Group 2	Drive	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#9	LEFT BUMPER	nsistor Q9	Ouput Board	Color YEL-VIO	J10-P4/5	Voltage 50 _v DC	Control Line Color BLU-BRN		or Bulb Type 26-1200 ひ
			·					J9-P1	090-5044-00T 26-1200 ひ
#10	RIGHT BUMPER	Q10	A	YEL-VIO	J10-P4/5	50v DC	BLU-RED	J9-P2	090-5044-00T 26-1200 ℧
#11	BOTTOM BUMPER	Q11	I/O	YEL-VIO	J10-P4/5	50 _v DC	BLU-ORG	J9-P4	090-5044-NL 25-1240 O
#12	3-BANK (DROP TARGET) RESET	Q12	Power	YEL-VIO	J10-P4/5	50 _v DC	BLU-YEL	J9-P5	090-5034-00B
#13	RIGHT RAMP DIVERTER	Q13	Driver	YEL-VIO	J10-P4/5	50 _v DC	BLU-GRN	J9-P6	32-1800 O
#14	GARAGE RAISE	Q14	▼	YEL-VIO	J10-P4/5	50 _v DC	GRY-GRN~3A Fuse~BLU-BLK	J9-P7	22-1080 ひ 090-5032-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	·	GRY-YEL~3A Fuse~RED-YEL	J10-P1/2	50 _v DC	ORG-GRY	J9-P8	23-1100 O 090-5030-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50 _v DC	ORG-VIO	J9-P9	23-1100 ひ 090-5030-00T
	Low Current Coils Group 1	Drive	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#17	LEFT SLINGSHOT	Q17	Ouput Board	BROWN	J7-P1	20 _v DC	VIO-BRN	J7-P2	23-800 ඊ
#18	RIGHT SLINGSHOT	Q18		BROWN	J7-P1	20 _v DC	VIO-RED	J7-P3	090-5001-00T 23-800 ひ
#19	FLASH: UPR RIGHT (BACK PANEL)	Q19		ORANGE	J6-P10	20 _v DC	VIO-ORG	J7-P4	090-5001-00T #89 Bulb
#20	UPR ACCELERATOR MAG (AUX)	Q20	I/O	VIO-RED~Triple	J2-P3~Triple	50v DC	ORG~Triple	J2-P7~Trp.	165-5000-89 22-700 ひ
#21	RIGHT TRACK EXIT DIVERTER	Q21	Power	Aux~VIO-YEL BROWN	Aux~J10-P3 J7-P1	20 _v DC	Aux~VIO-YEL VIO-GRN	Aux~J7-P6 J7-P7	090-5071-00 26-1200 ひ
#22	LEFT TRACK EXIT DIVERTER	Q22	Driver	BROWN	J7-P1	20 _v DC	VIO-BLU	J7-P8	090-5044-00T 26-1200 ひ
		Q23	▼	BROWN	J7-P1	20v DC	VIO-BLK	J7-P9	090-5044-00T 26-1200 ℧
#23	INNER ORBIT POST			-			-		090-5044-00T Opt. 5v
#24	OPTIONAL COIL D iode On Terminal Strip (if noted)	Q24		RED	J16-P7	5v DC	VIO-GRY	J7-P10	
	Low Current Coils Group 2 Tra	Drive nsistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#25	LWR ACCLRTR MAG LT (AUX)	Q25		VIO-RED~Triple Aux~VIO-YEL	J2-P1~Triple Aux~J10-P3		ORG-BRN~Triple Aux~BLK-BRN		22-700 ひ 090-5071-00
#26	LWR ACCLRTR MAG RT (AUX)	Q26		VIO-RED~Triple Aux~VIO-YEL	J2-P2~Triple Aux~J10-P3		ORG-RED~Triple Aux~BLK-RED		22-700 ひ
	PIT LOCK RELEASE LEFT	Q27	A	BROWN	J7-P1	20 _v DC	BLK-ORG	J6-P3	090-5071-00 26-1200 O
#28	PIT LOCK RELEASE RIGHT	Q28	I/O	BROWN	J7-P1	20v DC	BLK-YEL	J6-P4	090-5044-00T 26-1200 O
#29	MIDWAY SIGN (HOT DOG)	Q29	Power Driver	BROWN	J7-P1	20 _v DC	BLK-GRN	J6-P5	090-5044-00T 32-1800 ひ
	FLASH: LEFT X3	Q30	Dilvei	ORANGE	J6-P10	20v DC	BLK-BLU	J6-P6	090-5031-00 #89 Bulb
#31	FLASH: RIGHT X3	Q31	▼	ORANGE	J6-P10	20v DC	BLK-DEO	J6-P7	165-5000-89 #89 Bulb
	FLASH: TEST CAR X2			ORANGE	J6-P10	20v DC	BLK-GRY	J6-P8	165-5000-89 #89 Bulb
πυΖ	Note: In Test Flash Lamps Menu ("Fl	Q32 ash" Ico	on), Flashers te	sted are all Flash La	imps located b	etween Q	1-Q32 (This Game:	Q19, Q30-Q3	165-5000-89 2)
		Drive nsistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage		D.T. Control Line Connect	Coil GA-Turn
	AUX 1: LEFT UP/DOWN POST	Q1	UK 3X	BROWN	J7-P1	20v DC	WHITE	J2-P3	26-1200 ひ 090-5044-00T
	AUX 2: CENTER UP/DOWN POST	Q2	Trans. Driver	BROWN	J7-P1	20v DC	RED	J2-P4	23-1100 O 090-5030-00T
	AUX 3: RIGHT UP/DOWN POST	Q3	Board	BROWN	J7-P1	20 _v DC	ORANGE	J2-P7	26-1200 O

UCoil Note: ○ Either -00B or -00T can be used for coil replacements. B/T listed is preferable for easier diode access & may differ on game.





COIL & FLASH LAMP LOCATIONS



Domestic Pinball & Redemption Distributors Map Manitoba Alberta **Saskatchewan** otherino Quebec Brunswick Washington North Maine Minnesofa Montana Dakota **Onlario Oregon** Idaho South 1 2 Dakota **Wyoming** llowa Nebreeke Nevada DE Wab **Colorado** `MD Missouii 4 2 Kaneae Kentucky California de la Califo Tennesse <u>Oldahoma</u> Alpose Carolina Aritzona Mexico Mexico Arkansas **Ceougla** Alabama 2 **EEXED** Louisiana 3∙ Distributor(s) located in this state/province. No Distributor in this state/province. Mexico

International Distributors Map | Commark Germany | Moscow, Russia Rustria Rus

For Parts & Service, call your nearest Distributor. View the above maps & the directories on the next page to locate your closest Distributor in your state, province, or country. Distributors and phone numbers are subject to change. Call Stern® Pinball, Inc. (Parts Sales & Technical Support) with any questions or if your Distributor cannot help you: 1-800-542-5377 (in USA or Canada) or 1-708-786-5466. Visit us at www.SternPinball.com for current Distributor Information & other pinball needs.



Domestic Pinball & Redemption Distributors Directory

Birmingham Vending Birmingham (1) 1-205-324-7526 Franco Distributing Montgomery (2) 1-334-834-3455 **Betson West** Phoenix 1-480-380-8857 Mountain Coin Phoenix 1-602-269-7596 CALIFORNIA **Betson West** Buena Park (1) 1-714-228-7500 So. San Francisco (2) 1-650-952-4220 C.A. Robinson Los Angeles (3) 1-323-735-3001 San Francisco (4) 1-650-871-4280 COLORADO **Mountain Coin** Denver 1-303-427-2133 TDM Distributing

Williamantic

1-860-423-1403

Birmingham Vending

Orlando (1)

1-407-425-1505

Brady Distributing

Miami [Miramar] (2)

1-954-874-1100

Orlando (1)

1-407-872-1666

Greater Southern Dist.

Smyrna

1-770-803-3040

American Vending

Elk Grove Village

1-847-439-9400

Atlas Dist. International

Elk Grove Village

1-847-952-7500

Parts & Service Only: **New Orleans Novelty** 1-504-888-3500 ARYLAND **Betson Enterprises** Baltimore

Greater America Dist.

Johnston

1-515-278-4455

Moss Distributing

Des Moines

1-515-266-6422

Atlas Dist. International

Indianapolis

1-317-786-6892

Shaffer Distributing

Indianapolis 1-317-899-2530

KANSAS

United Dist., Inc.

1-316-263-6181

AMA Distributors, Inc.

Metairie (1)

1-504-835-3232

1-410-646-4100 Parts & Service Only: Weiner Distributing Baltimore 1-410-525-2600

SSACHUSETTS Betson Ent. (NECO) Norwood (1) 1-781-769-9760 **Gekay Sales** E. Longmeadow (2) 1-413-525-2700

Atlas Dist. International Wyoming (1) 1-616-241-1472 **Shaffer Distributing** Livonia (2) 1-734-432-1040

Lieberman Music Minneapolis (1) 1-952-887-5299

Moss Distributing Eagan (2) 1-612-798-8030

Greater America Dist. Kansas City (1) 1-816-531-4300

Moss Distributing Kansas City (1) 1-816-231-6600 **Shaffer Distributing**

St. Louis (2) <u>1-314-645-3</u>393

Central Dist. Omaha 1-402-493-5600 Greater America Dist.

Omaha 1-402-553-2812

Mountain Coin Las Vegas (1) 1-702-798-0900 Reno Game Sales

1-775-829-2080 **Betson Enterprises** Carlstadt (1)

Reno (2)

1-201-438-1300 Jack Guarnieri Service Co., Inc. (Pinballsales.com) Lakewood (2) 1-732-364-9900

NEW MEXICO **Mountain Coin** Albuquerque 1-505-345-7706

Betson Enterprises New Hyde Park (2) 1-516-354-4647 Svracuse (3) 1-315-437-2400

Parts & Service Only: **Bay Coin** Richmond Hill (1) 1-718-291-5757 ORTH CAROLINA

Brady Distributing Charlotte (1) 1-704-357-6284

Parts & Service Only: **Operators Distributing** Archdale (2) 1-336-884-5714

Atlas Dist. International <u>1-513-851-4100</u> **Cleveland Coin**

Cleveland (2) 1-216-692-0960 Shaffer Distributing Columbus (3) 1-614-421-6800

Valley View (4) 1-216-447-4486 OKLAHOMA

Galaxy Distributing Tulsa 1-918-835-1166

Betson West Portland 1-503-772-4567

Mountain Coin Portland 1-503-234-5491

Specialty Coin Products Portland 1-503-786-9200 Toll-Free 1-800-987-4946

> Betson Enterprises King Of Prussia (1) 1-610-265-1155 Pittsburgh (2)

1-412-331-8703 Superior Amusements Wilkes-Barre (3) 1-570-824-9994

Shaffer Distributing Pittsburgh (2) 1-412-920-1300

UTH CAROLI Parts & Service Only: **Green Coin** Mrytle Beach

1-843-626-1900 TENNESSEE **Brady Distributing**

Memphis 1-901-345-7811 Parts & Service Only:

Green G.A.M.E.S. Memphis 1-901-353-1000

Amusement Distributors

San Antonio (3)

1-210-225-3844

Betson Texas

Dallas (1)

1-214-638-4900

Commercial Music

1-214-741-6381

Discount Arcade Games

Crowley (1)

1-817-297-0440

H.A. Franz, & Co.

Houston (2)

1-713-523-7366

San Antonio (3)

1-210-226-6322

Master Sales

Corsicana (4)

1-903-874-4740

Mountain Coin

Salt Lake City

1-801-262-5494

Struve Distributing

1-801-328-1636

Mountain Coin

Auburn (Seattle)

1-206-682-5700

Pioneer Sales & Svc.

Green Bay (1)

1-920-336-5800

Menomonee Falls (2)

1-262-781-1420

Lieberman/Viking Vend.

Menomonee Falls (2)

1-262-703-4168

ONTARIO Starburst Coin Mach. Toronto 1-416-251-2122

BRITISH COLUMBIA Parts & Service Only:

Can. Coin Machine Burnaby (1) 1-604-420-4008

Parts & Service Only: **Pacific Vending** Vancouver (2) 1-604-324-2164

Note: For states and Canadian Provinces which do not have Distributors, call the neighboring state or province with the city . closest to you (indicated

with a white dot). States or Provinces with more than 1 city containing a distributor are numbered. View the map on the previous page.

Note: Distributors are subject to change. Visit us at www.SternPinball.com for current Distributor Information.

International Distributors Directory

Amusement Mach. Dist. Matraville 2931-6-6000 **AUSTRIA** Parts & Service Only: R. Rupp Leibnitz

[43] 3452-8-6105 BELGIUM NAMUSCO

Brussels 2414-4596

JK Automater A/S 9792-0925 **ENGLA**

see UNITED KINGDOM

Pelika net Ov 8 (0) 9-290-450

FRANCE Avranches Automatic Ducev [33] 2338-9-6162

SFA Paris [33] 1532-6-8080

> ADP Gauselmann Espelkamp

5741-27-3384 Bergmann Int'l Gaming Rellingen

4101-3-0240 Witten 2302-28-2540

CONTINUED MEXIM Espelkamp

5772-4-9422

HOLLAND see THE NETHERLANDS

> ITALY (RSM) Tecnoplay S.A. San Marino

5499-0-1508 JAPAN HIC, Inc.

7176-4040 **NETHERL**

JVH Gaming Products Tilburg 1359-5-3200

Coin Cascade Ltd. Christchuch

3338-1411 Parts & Service Only: **Amco Machine Supplies** Auckland

9846-7606 [64] NORWA

Parts for Pinballs Sandefjord 9242-1402 [47] Vendcomatic

2291-8383

PORTUGA Jacinto & Martins, S.A. Belas

1214-32-5624 or 1214-32-5638

O.D.A. Game Machines Moscow

[095] 219-2949 *or* [095] 219-8917

SOUTH AFRICA

K & W Amusements Port Elizabeth 4148-4-3344 or 4148-4-2940

Comercial Cocamatic Coslada (Madrid)

[34] 9167-1-6980

Bjuvia Fritid AB Biuv 4238-6900

WITZERLAND Novomat, A.G. 6238-8-8961

Warehouse of Games Dubai 1-4881-8431

UNITED KINGDO Flectrocoin

London, England 2089-65-2055

Parts & Service Only: Electrocoin Aftersales Cardiff, S. Glamorgan [44] 2920-45-0345

Note: From inside the US, use prefix 011-.





POWER REQUIREMENTS

A

This game **must be connected to a properly grounded outlet to reduce shock hazard** & insure proper game operation. See Sec. 5, Schematics & Troubleshooting, Chp. 3, Cabinet Wiring (Transformer Power Wiring), for transformer connections required for **Normal**, **High**, and **Low Line** conditions.



Normal Line:	110v AC - 125v AC @ 60Hz						
Domestic	AVG OPERATION	MAX OPERATION					
use an 8AMP 250v Slo-Blo Fuse.	CURRENT: 2.8AMP	CURRENT: 8AMP					
	WATTAGE: 329w WATTAGE: 940w						
High Line:	218v AC - 240v AC @ 50Hz						
Export	AVG OPERATION	MAX OPERATION					
use 2x 5AMP 250v Slo-Blo Fuses.	CURRENT: 1.8AMP	CURRENT: 5AMP 8AMP* England Hong Kong use					
(*England & Hong Kong use an 8AMP 250v S/B Fuse.)	WATTAGE: 412w	WATTAGE: 1145w 1832w * Kong üse an 8A Fuse.					
Low Line:	95v AC - 108v AC @ 50Hz / 60Hz						
Export Japan Only	AVG OPERATION	MAX OPERATION					
use an 8AMP 250v Slo-Blo Fuse.	CURRENT: 2.6AMP	CURRENT: 8AMP					
	WATTAGE: 264w	WATTAGE: 812w					

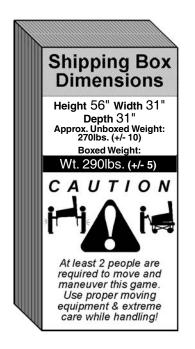
TRANSPORTATION IN IN IN IN GAME DIMENSIONS IN IN IN IN

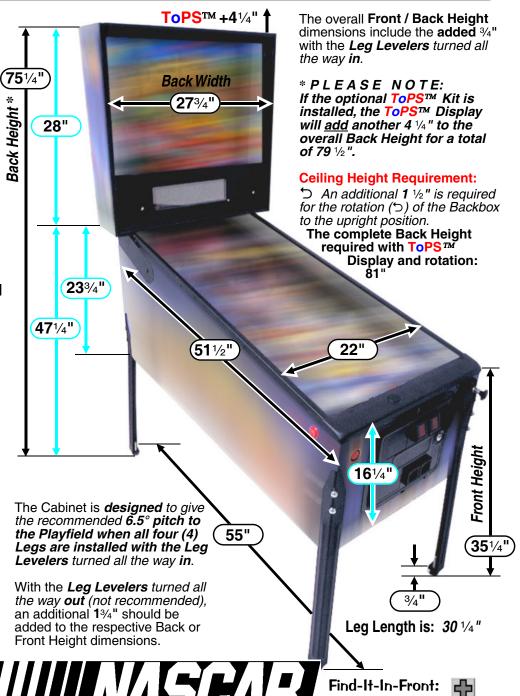


To reduce the possibility of damage, observe **ALL** precautions whenever transporting the game.

Read & follow Section 1, Chapter 1, Pinball Game Set-Up Procedures, and How to Secure the Backbox for Transporting. Remove the legs and secure the game within the transporting vehicle.

SAVE AND RETAIN ALL PRINTED INFORMATION INSIDE THE CABINET!





Dr. Pinball





NASCAR® Pinball Game Service Manual General Table of Contents See Sections 3 & 5, Table Of Contents, for details of that Section and it's Chapters.

For Proper Operation, four (4) Pinballs must be installed! li	nside Front
▶ Backbox PCB Fuses, ROMs, Bridges, Relays Playfield/Cabinet Fuses, Cab. Switches	DR. 🛭
► Find-It-In-Front: Dr. Pinball Section Explained ► How It Works	
► Diagnostic Aids ► CPU DIP Switch Setting	
Switch Matrix Grid, Dedicated Switches & Locations	
► Lamp Matrix Grid & Locations	
Coil & Flood Lower Locations	
➤ Coil & Flash Lamp Locations ➤ Domestic Pinball & Redemption and International Distributors Maps	
► Domestic Pinball & Redemption and International Distributors Maps ► Domestic Pinball & Redemption and International Distributors Directories	
► Power Requirements ► Transportation ► Game Dimensions	
Game Manual General Table of Contents	
OPERATOR ALERT: NASCAR® Pinball Game Functionality Test	
•	
SECTION 1	
Chapter 1, After Set-Up	
Pinball Game Set-Up Procedures	
Pinball Game Set-Up Future Reference	
SECTION 2	
Chapter 1, Game Operation & Features	
Start of Game Features: Starting a Normal Game, Team Play, Tournament Play with To	PSTM
During Game Features: Feature Mode & Combination Shots, Multiball & Replay Feature	_
 End of Game Features: Game Endings, Match Features, Entering Initials/Name Auto Percentaging > Instruction Card 	
SECTION 3	
Portals™ Service Menu System Table of Contents (detailed outline of this section)	
Portals [™] Service Switch Set Access & Use (Function 1,; Function 2,; Function 3,) Chapter 1, Portals [™] Service Menu Introduction	8
How to Use This Section	
Portals [™] Service Menu Icon Tree	
 Portals[™]Service Menu Example ► Exiting the Portals[™]Service Menu 	
Chapter 2, Go To Diagnostics Menu	
Chapter 3, Go To Audits Menu	32-37
Chapter 4, Go To Adjustments Menu	
Chapter 5, Go To Installs Menu	
Chapter 7, Go To Tournament Menu	
SECTION 4	
Chapter 1, Parts Identification & Location (The Pink Pages)	
Table of Contents & Overview	
NASCAR® Pinball Backbox Assembly, 500-6002-86-86	
NASCAR® Pinball Speaker Panel Assy. for the Backbox, 515-6888-03-86 and Associated Page 1	<i>arts:</i> 61
Cabinet - Parts & Switches	62-63
Playfield Top - Miscellaneous Parts ☐ and Brackets ☐ Playfield Bottom - Miscellaneous Parts █ and Brackets █	
Playfield Top & Bottom - Switches (Above) and Switches (Below)	
Playfield Top - Roll-Under Gates and Spinners	



Section 4, Chapter 1, Parts Identification & Location (The Pink Pages) Continued on the Next Page

<u> </u>	
Playfield Top - Flat Rails 🔲, Wood Rails 🔼, Ball Guides 📕 & Wire Forms 📘	68
Playfield Top - Plastics (Screened & Clear) Kit, Decals & Mylar Kits	
Playfield Top & Bottom - Metal Posts ☐ & Fin Shank Screws ☐ (Actual Size)	
Playfield Top & Bottom - Nylon Stop, KEPS, Hex, T-, Flange, Pal & Wing Nuts (Actual	
Playfield Top - Hex Spacers (Actual Size)	72-73
Playfield Top - Plastic Posts & Spacers 🗌 & Metal Spacers 🚺 (Actual Size)	74-75
Playfield Top & Bottom - Rubber Parts Red ■, Black ■ & White □ (Rings Actual Si	
Playfield Top & Bottom - Small Bayonet Sockets & Bulbs (Actual Size)	
Playfield Bottom - Large Bayonet Sockets & Bulbs (Actual Size)	
Playfield Top & Bottom - Wedge Base Sockets & Bulbs (Actual Size)	
Chapter 2, Drawings for Major Assemblies & Ramps (The Blue Pages)	81-104
Table of Contents & Overview	
Ball Shooter (Plunger) Assembly, 500-6146-00-04N	
Autoplunger Arm Weld Assembly, 500-6091-00, Autoplunger Coil Assembly, 500-60	92-02B and
Shooter Lane Switch Assembly, 500-6930-00	(Bot) 82
4-Ball Trough Assembly, 500-6318-24-86	83
Trough Popper Assembly, 500-6850-00	(Top) 84
Plastic Under-Trough (below) Individual Parts Only	(Bot) 84
Eject VUK (Vertical Up-Kicker) Assembly, 500-6846-00	
Ball Deflector (Top Orbit) Assembly, 500-6841-00	(Bot) 85
Flipper (Left) Assembly, 500-6543-14 and Associated Parts:	
Flipper (Right) Assembly, 500-6543-04 and Associated Parts:	
Slingshot (Left & Right) Assemblies, 500-5849-00 (Qty. 2)	
Bumper Top, Bumper Bottom & Bumper Switch Individual Parts Only	89
Hot Dog Sign (Above Playfield) <i>Individual Parts Only</i>	
Hot Dog Drive Assembly (Below Playfield), 500-6845-00	
2-Post Ball Diverter Assembly, 500-6837-00 and Associated Switch Parts:	
Diverter (Left) Assembly <i>Individual Parts Only</i>	
Diverter (Right) Assembly <i>Individual Parts Only</i>	93
Diverters (Left & Right) and Blades Disassembly For Repair (Procedure)	
▶ 1- & 2-Coil (Ball Accelerators) Magnets Disassembly for Repair (Procedure)	
1-Coil (Ball Accelerator) Magnet Individual Parts Only	94
2-Coil (Ball Accelerator) Magnet <i>Individual Parts Only</i>	
3-Bank Drop Target Assembly, 500-6794-01-86	
Car Target Up-Down Scoop (VUK) <i>Individual Parts Only</i>	
Car Target (Garage) Up-Down Scoop Disassembly For Repair (Procedure)	
Right Plastic Ramp, Truck (Ramp) Kicker, Diverter and Wire Ramps Individual Part	ts Only100-101
▶ Left & Right Ramp Removal as a single unit (Procedure)	100-102A—100-102B
Left Plastic Ramp <i>Individual Parts Only</i>	
Back Panel and Motor (Rotating Car Target) <i>Individual Parts Only</i>	
▶ Rotating Wheel Target & Back Panel Disassembly For Repair (Procedure)	103A-103B
▶ UK ONLY OPTIONAL: Ball Deflector Asssemblies, 500-5788-02 (Qty. 2)	
UK ONLY OPTIONAL: Up/Down Post Assembly, 500-6293-00	
•	• • •
SECTION 5	105-160
Schematics, Wiring, PCBs & Troubleshooting Table of Contents (detailed outline of	f this section) 105
· · · · · · · · · · · · · · · · · · ·	•
y Conc Botanoa Chart rabio	
Chapter 1, Backbox Wiring (The Yellow Pages)	
Chapter 2, Playfield Wiring (The Yellow Pages)	
Chapter 3, Cabinet Wiring (The Yellow Pages)	
Chapter 4, Printed Circuit Boards (PCBs) (The Yellow Pages)	115-160
APPENDIXES A-J	Δ1_ I1
Appendixes Table of Contents (detailed outline of this section)	
Appendixes A-J	A1-J1
Plastic Part Color Chart	
Glossary of Terms	Last Page
Limited Warranty, Cautions, Warnings & Notices	Last Page



This document outlines a quick functional test of the major components of NASCAR® Pinball to be followed by a trained or qualified technician. If these steps are followed in order, it can be assumed the game can be placed into operation. Any failure should be fixed before moving to the next step of the test. ENTER PORTALS (DIAGNOSTICS) IF REQUIRED. READ YOUR SERVICE GAME MANUAL (SECTION 3) FOR MORE INFO!

- 1. Set the game up so the bubble level is centered 6.5° (degrees). The race track feature assumes a game pitch of 6.5°. Pitching the game MORE steeply than this may cause problems with the race tracks ability to propel the balls all the way around the circumference of the game. Pitching the game LESS than this could adversly effect the games earnings.
- 2. Make sure 4 Pinballs are installed in the game (find them in the cash box).
- 3. If you haven't already done so, remove the playfield glass.
- 4. Turn on (power-up) the game. CAUTION: WITH THE GLASS OFF NEVER TOUCH ELECTRONICS DIRECTLY. SHOCK COULD OCCUR.



- 5. Check the coin mechs by placing coins into the game. Do credits register? Adjust the coin mechs, if necessary.
- 6. Is the Start Button flashing with credits on the game? If not, check if a bad Start Button bulb?
- 7. Make sure the Coin Door is closed (Game energized).
- 8. Press the flashing Start Button on the front of the cabinet. 1 pinball should appear on the Shooter Lane (left side front).
- 9. Use the Ball Shooter (Plunger) to launch the ball. The ball should go around the race track (all around the game) 2 times. This should show if the race track is functional. If the ball does not accelerate after going thru the race track magnets investigate the problem (fuse, wiring, switches).
- 10. After going all the way around the race track, the ball should enter the main playfield by means of the Right Diverter Gate (curved blade). Did the diverter opened OK? If not, check the Right Diverter Assembly. NOTE THE ADJUSTMENT PROCEDURE ON THE ASSEMBLY BELOW THE PLAYFIELD.
- 11. Catch the ball and hold onto it. Use your fingers to knock down all 3 Drop Targets (right side of playfield). Do they go down and then reset? If not, check the 3-Bank Drop Target Assembly.
- 12. Drop a ball into the Pit Lane area on the left side of the game (3-Ball lock area). Does the 2-Post (Pin) Ball Diverter pull the right post (pin) down and let the ball back to the main playfield area? The left post (pin) will be check in Step 24.
- 13. Roll a ball up and around the Right Ramp. Does the switch activate? (You should see a display on the dot matrix giving you "Ramp Miles".)
- 14. Is the Rotating Car spinning inside the Nascar Hauler on the Left Ramp? The car should be spinning after all of the previous tests. Check for binding or an unplugged motor.
- 15. Roll ball up the Left Ramp and try to NOT HIT THE SPINNING CAR. You should once again see "ramp miles" the ball should be kicked out, to the Right Ramp. If no kick, does the kicker switch need to be adjusted? When the ball is kicked, does the Ramp Diverter close and send the ball to the Left Flipper? If not, check the diverter wiring.
- 16. Roll the ball up the Left Ramp again, this time HIT THE SPINNING CAR. The game should award a "move up 1 position in the race". The ball should then roll back against the wire gate and fall left onto pit lane. If no award is given, are the 2 OPTO's on the hauler reading correctly? Are the connectors swapped in their plug in position on the OPTO board behind the hauler? If this is a problem, go to switch test and check out those 2 OPTO's. Follow decals on wires under the playfield & back panel or refer to the vellow pages 148-151 in your Service Game Manual.

Page condinues on reverse >

Instruction Sheet SPI Part Number: 756-5038-86



- 17. Check each of the POP Bumpers manually to be sure they fire when their switch is made. Any adjustments needed? Caution! Use a pinball, the ring will pull down quickly. Watch your fingers.
- 18. Take a ball and hit the Captive Ball on the right side of the game. The trapped ball should then hit its Stand-Up Target and cause an effect. Does the Stand-Up Target need to be adjusted?
- **19.** Hit the Test Car with the ball. The car should raise itself above the playfield. If hitting the car produces no result, the car hit switch should be checked.
- 20. With the car in the air (up position), place a ball in the Garage Popper (Up-Down Scoop / VUK). The ball should be shot back out onto the playfield. If the ball does not register, check the popper switch in the garage.
- 21. Any problem with the test car/up down switch will show up as a series of sound calls but no motion of the mechanism. Check the up down switch.
- **22.** Manually press the playfield orbit switches, and drain switches. *Does a sound occur? If not, check their adjustment.*
- 23. Take the ball and drop it into the center drain area. You should hear the ball being popped up into the ball trough and the game should go to ball end (Bonus count). If you do not hear the popped ball being handled, check the lower drain popper switch adjustment.
- 24. ONE LAST TEST. This one insures that main multiball will operate correctly. Put a ball into play and then catch it. Manually roll the ball thru the lanes that are lit and say "COLLECT RACE". This lights the RACE letters in the center of the playfield. Manually knock down the Drop Targets to continue to light the "COLLECT RACE" shots. Then roll the ball thru the shots. Once all 4 RACE letters are lit, the Left Ramp will light for ball lock. Roll 2 balls up the ramp. They should be blocked by the rotating car assembly which will park itself to block the path of the balls. The 2 locked balls should fall onto pit lane and stay there. The rotating car mech should then move out of the way of blocking the Left Ramp shot. Finally a third ball should be rolled up the Left Ramp and go all the way into the rear kicker. That should start main Multiball feature mode. After a big show, one ball from pit lane will begin orbiting on the race track with the other 2 on the main playfield. This is how to test the Left Post (Pin) on the 2-Post Diverter mechanism on pit road. If any of this fails, check the rotating car position OPTO's or the pit lane switches for adjustment.

That's it!

If all of the above works, the game is functionally sound and can be put into play.

If any adjustments need to be made on the major mechanisms, open your Service Game Manual.

Section 3, Chapter 2 covers Diagnostics (Portals™ Service Menu).

Use this section to test Switches, Lamps & Coils.

For mechanical adjustments and/or disassembly procedures, open to Section 4, Chapter 2 (Blue Pages). Repair Procedures are provided for this game unique assemblies. Any questions, comments or help,

PLEASE CALL OUR TECHNICAL SUPPORT STAFF at 1-800-542-5377 or 1-708-345-7700 (choose option 1).

One important last note: please heed the decal on the Garage (Car Up-Down) Mech under the playfield.

If ever making adjustments or changing parts, make sure the Tape is in place and is not worn and magnalube is applied to the Pem Studs where the bearings are located (A) under the Retaining Plate (B). Details on this assembly start on Page 98 of your Game Manual.



Instruction Sheet SPI Part Number: 756-5038-86



After Set-Up

Pinball Game Set-Up Procedures

...after reading the Pinball Game Set-Up Instruction Sheet (SPI Part № 755-5310-00) included with your New Pinball Game, continue with the below procedures:

With the Back Glass Removed:

1. Check all connectors in the Backbox for loose wire terminations. Reseat any loose wire by pushing in on the terminal. Push on all connectors plugged into the CPU/Sound Board, I/O Power Driver Board, and the Display Power Bd. to check that they are properly seated. Ensure Fluorescent Light Tube is seated correctly. Check that all fuses are seated properly. Close and lock the Backbox and secure its' keys back inside the Coin Door.

With the Playfield Glass Removed:

2. Remove all shipping tie downs, shipping blocks, packing foam, etc., if present.

READ ALL PRINTED INFORMATION!
Shipping Instructions and/or Decals describe warnings, cautions, and/or important information specific to the game. SAVE ALL IN CABINET!

If pinballs were already installed into the Ball Trough (under the arch), remove them before performing the following step. ***Pinballs can fall out and away from the playfield ***

- 3. Raise the playfield and rest it against the Backbox. See the illustration "Easy Access Service System 2 Positions" on Page 4.
- **4.** Visually inspect all cabinet cables and connector terminations; ensure no wires or cables are pinched and that cable harnesses are not pulled tight.
- **5.** Make sure the proper amount of pinballs are installed (Amount of balls are always specified

on decal attached to the lock down assembly and at the top of the inside cover).



6. Lower the playfield and ensure game is **level side-to-side** by adjusting Leg Levelers, if required. See the illustration "**Leg Leveler Adjustment**" on Page 4. Start with the Leg Levelers turned all the way in (1.25" from floor to bottom of leg), depending on the condition of the floor, adjust the Leg Levelers as required until the **game pitch is 6.5**°, determined by the Bubble Level.

USE THE BUBBLE LEVEL ON THE WOOD RAIL (LOWER RIGHT) TO DETERMINE IF LEVEL IS ACHIEVED. BUBBLE SHOULD APPEAR BETWEEN THE 2 BLACK LINES. SEE PAGE 4 FOR AN ILLUSTRATION.

The playfield incline affects difficulty of play. Use the recommended incline; Game difficulty is best varied using game adjustments.

With the Coin Door Open:

- 7. If desired, perform any self tests at this time (see Section 3, Chapter 1, Portals™ Service Menu Introduction, and Chapter 2, GO TO DIAGNOSTICS MENU, for instructions on how to enter "Begin Play Test" and "Game Name Test" Menus to test components on the game).
- 8. If desired, adjust Game Pricing, Standard and/or Custom (see Section 3, Chapter 4, GO TO ADJUSTMENTS

 Per CE: "The appliance has to be placed in a horizontal position." "This position." "Thi





appliance is not to be cleaned by a Water Jet."

Pinball Game Set-Up Future Reference

CAUTION: At least 2 people are required to move and maneuver game.

Use proper moving equipment & extreme care while handling. Pinball game is 260lbs (+/- 10).

Refer to Game Manual for further Game Set-Up Procedures (Sec. 1, Chp. 1) and other important information!

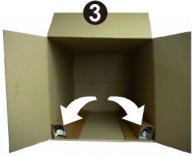
TOOLS REQUIRED: 5/8" Socket Wrench & Utility Knife



 Before unpacking box, lay the box flat on its side with "TRUCK THIS SIDE ONLY" facing the floor.



Slide game out using the Black Nylon Strapping as a handle.



Remove the Four (4) Identical Legs with Levelers
from the carton and set
aside. (SAVE! all packing
materials and information
sheets related to this pinball
until Set-Up is complete.)



 At this point DO NOT CUT STRAPPING (You want to keep the Backbox secured in the down position). Loosen and remove the 8 Leg Bolts (use 5/8" Socket Wrench) and set aside.



 Lift game into an UPRIGHT POSITION (Coin Door Facing Up).



 Install FRONT LEGS using the bolts removed from Step 4. Secure tightly. Take care not to scratch the Black Finish on any of the Legs.



 Carefully set the game down on the FRONT LEGS. Care should be taken...Game is heavy, two (2) people are recommended for this and the following step.



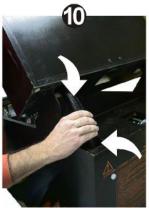
 Using supports or two (2) people, prop the rear of the cabinet up and install REAR LEGS. Secure tightly.



9. Cut BLACK NYLON STRAPPING. CAUTION: Strapping will SNAP, protect your eyes! Use extreme care when using a utility knife or scissors.



Pinball Game Set-Up Future Reference Continued



10. Lift the Backbox into the **UPRIGHT POSITION** (Ensure the cables do not get pinched).



After the BACKBOX is in the UPRIGHT POSITION. locate the 5/16" HEX KEY. While inserted, rotate KEY with a 3/4 turn until latched & locked.



NOTE: KEYS are tied to the Shooter Rod* (if equipped) or taped to the Playfield Glass (if equipped with Auto Plunger Button). Remove keys. One (1) set of keys opens the Coin Door, the other set is used to unlock the Back Glass to gain access to the White Star Board System.



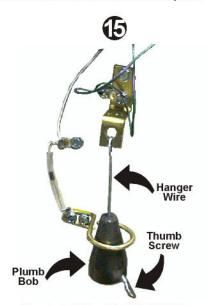
13. Open the Coin Door and pull the YELLOW HANDLE to the LEFT and at the same time pull up on the FRONT TOP MOLDING and remove. The GLASS can now be pulled out towards you and removed. TAKE CARE while moving; set glass on a safe surface.



Door, remove the RETAIN-ING RING at the rear of the CASH BOX and open. Remove the PINBALLS & the PLUMB BOB from the SPARE PARTS BAG.

(Save the other spare parts in cabinet). Install the PINBALLS by placing them on the playfield so they can roll into the





15. Install the PLUMB BOB on the Hanger Wire & tighten the Thumb Screw. Loosening the Thumb Screw & lowering or raising the PLUMB BOB makes the Games Tilt Function more or less sensitive.

Remove the PINBALL GAME MANUAL (stapled to side of the left wall of the cabinet). Review Section 1, Chapter 1, which describes how to lift the playfield to access the Plumb Bob Tilt Assembly. The manual gives you all the important information you need to prepare for final set-up and other important information (such as Parts, Diagnostics, Schematics and more...).



ALWAYS STORE THE MANUAL & INFORMATION SHEETS INSIDE THE CABINET WHEN NOT USING.



PLUMB

How to Secure the Back box for Transporting

For more Backbox deta
Chapter 1, Backbox As

Step 2.

Carefully pull the
Backbox forward into
the "down" position.

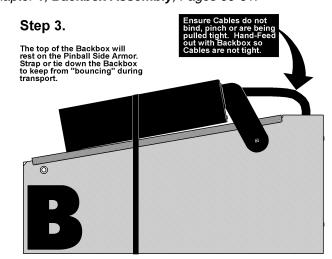
Step 3.

The top of the Backbox wirest on the Pinball Side Ar
Strap or tie down the Back
to keep from "bouncing" deta
transport.

Step 1.

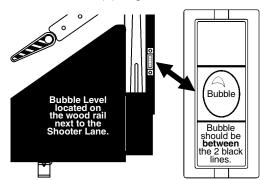
Unlock
the RotoLock
(CounterClockwise)

For more Backbox details & part numbers, see Section 4, Chapter 1, Backbox Assembly, Pages 60-61.



Leg Leveler Adjustment

Attach the four (4) Leg Assemblies to cabinet corners with the eight (8) leg bolts provided .



Start adjustment with the leg levelers *turned all the way in*.

View the *bubble* in the level provided on the right side wood rail.

Adjust the front or rear levelers as necessary to cause the bubble to float between the two (2) black lines.

Use a pinball to roll down the center of the playfield for side-to-side leveling.



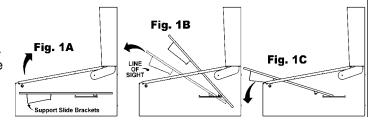
Note: For custom adjustment greater than >6.5° can be achieved by turning out the rear leg leveler(s), however, it is not recommended.

Easy Access Service System - 2 Positions

With the front molding & glass removed, carefully lift the playfield (take care when using the Bottom Arch to hoist).

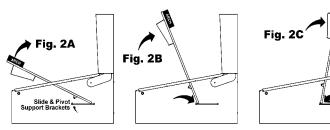
Position 1

When lifted high enough, the *Playfield Support Slide Brackets* (Fig. 1A) can be seen and can clear the cabinet front (Fig. 1B). At this time, pull the playfield toward the front of the cabinet, checking that the mechanical components clear the cabinet front, then rest the playfield on the *Playfield Support Slide Brackets* at the front channel of cabinet (Fig. 1C):



Position 2

With the playfield at rest, hold the sides & pull toward the front of the cabinet (approx. 6" to 8"), until resistance is felt from **Edge Slide Brackets** stopping against the **Slide & Pivot Support Brackets** located on either side of the cabinet (**Fig. 2A**). At this time, swivel the playfield toward the Backbox, then rest on the top edge (**Fig. 2B & 2C**).



Section 1, Chapter 1 Page 4



Cabinet Leg

Leg Leveler turned all the way in.

Game Operation & Features

Start of Game Features

Starting a Normal Game

Insert coin(s). The game generates a sound for the first coin & for each subsequent coin with the display indicating the number of credits posted. Press the Start Button and a start-up sound is produced, and the posted credits are reduced by one. Subsequent players can be added (up to 4 can play!) by pressing the Start Button before the end of ball 1 (with sufficient credit in the game).

The display now indicates the player or # of players selected from the total depressions of the Start **Button**. The display indicates the ball in play, and a ball is served to the *Shooter Lane*. An introduction is shown followed by Skill Shot Graphics and/or instructions. Pressing the Start Button after ball 1 of any player will start a new game (if credits are available), but only if the Start Button is depressed for 2-3 seconds. This delay is to avoid accidental "re-starts" of a game. **Note:** Any partial credit remaining during game play after the end of ball 1, or power down, will be eliminated.

Starting Team Play (Doubles!)

This option is adjustable with Standard Adj. 50, Team Scores (Default = NO). If Standard Adj. 50, Team Scores is changed to YES, then Team Play will be made available. *Team Play only works in a 4-Player Game*. The totals for Players 1/3 (Team 1) & Players 2/4 (Team 2) are then displayed individually *as well* as the combined score for BOTH TEAMS.

Starting Tournament Play with 1095



This Pinball Game is ToPS™ (Tournament Pinball System) Ready. Optional Tournament equipment & hardware (sold separately) is required. Review Section 3, Chp. 7, GO TO TOURNAMENT MENU, for more info!

Unlike a "Normal Game", the Tournament Game is started by depressing the Tournament Start Button (located on the Front Molding, if installed). If adequate credit(s) are posted and a *Tournament is started* via **Portals**TM (select the "TOUR" Icon in the Main Menu), the Tournament Start Button will flash. Any adjustments or installs changed will not be in affect. Starting a Tournament Game defaults to preprogrammed Tournament Rules (e.g. No Extra Balls, Specials or Bonus Credits are awarded); however, starting a Normal Game after a Tournament Game will then revert back to any unique adjustments or installs performed previously. During and End of Game **Features** operate in the same manner (differences in adjustment defaults are present).

During Game Features

Feature Mode & Combination Shots

Chapter 1 of

Features are lit on the playfield and started by completing certain shots (e.g. completion of Target Banks, Orbit(s), Ramp(s) and/or any combination of the shots).

Multiball

Multiball is started after completion of certain features (amount of balls used depends on game rules).

Replay Feature

Replay awards are given as the player exceeds a High Score Level during game play. This can be adjusted with Standard Adj. 3, Replay Award (Default = CREDIT). Players exceeding the High Score Levels can receive: CREDIT EXTRA BALL, or SPECIAL. Adjust to **NONE** if a replay award is not desired.

End of Game Features

Game Endings

When all player(s) have played all balls (including any Extra Balls), the game ends. If power is interrupted during the course of a game, it will end that game (see Starting a Normal Game). Closure of the Plumb Bob Tilt Switch according to the number of tilts set, Standard Adj. 15, Tilt Warnings (Default = 01) or prolonged closure, will end the current Ball-In-Play. Closure of the Slam Tilt Switch on the Coin Door ends the current game(s).

Match Feature

At the end of each ball, earned bonuses are collected. At the end of the last ball of a game (including any extra balls, if applicable), earned bonuses are collected, then the system produces a random 2-digit number (a multiple of 10; 00 to 90). Matching the last 2 digits of the player's score with this number awards a credit. In Std. Adj. 13, Match Percentage (Default = 8%) can be changed from 0-10%. Changing the percentage to 0% displays the "Match Animation" at the end of the game, however, will never match nor award anything. Changing this adjustment to **OFF** will **not display** the "Match Animation" nor award anything.

Entering Initials/Name

If player achieved a new High Score in a game or achieved a *Special Feature* (*if given*) the player may enter 3 Initials. In Std. Adj. 29, High Score Initials (Default = 3 Initials) can also be changed to 10-Letter Name. Use the Flipper Buttons to choose a letter or character as seen on the Dot Display. Hitting the Start **Button** locks in the letter or character and proceeds to the next letter. The game then proceeds into the Game-Over Mode and then to the Attract Mode.

Note: Standard Adj. 31, Custom Message (Default = ON) can be displayed during the Attract Mode; enter letters in the same fashion.

For more details on Adjustments, see Sec. 3, Chp. 4.

Continued Next Page.

Section 2, Chapter 1 Page 5

Game Operation & Features

This game is equipped with Auto Percentaging, Standard Adj. 01, Replay Type (Default = AUTO, adjustable). The Replay Percent is automatically adjusted, Standard Adj. 02, Replay Percentage, or you can set a Fixed Replay Score. Four levels may be selected. Adjustments allow awarding of a "CREDIT" (or your setting) as each level is exceeded. This can be adjusted with, Standard Adj. 03, Replay Award (Default = CREDIT). With the Autopercentage Feature, if the actual replay percentage is higher or lower than that desired, the game will automatically adjust for the new recommended percentage score(s). You may choose to make a different "score-to-beat" adjustment; this is done by utilizing Standard Adj. 04, Replay Levels. For more details with Adjustments, see Section 3, Chapter 4, GO TO ADJUSTMENTS MENU; also, see see Section 3, Chapter 5, GO TO INSTALLS MENU for further customization of your Pinball Game.

Instruction Card

Below is a **COPY** of the Game Instruction Card (SPI Nr.: **755-5186-00-Y USA**). For a replacement Game Instruction Card on Astrobright Solar Yellow Card Stock, add **-Y** to the end of the Part Number above. If your card is lost or damaged, simply **COPY** this page and cut out the card as a temporary replacement until a new card is ordered.

(Hint: COPY & CUT along the dotted line and fold in the center to keep the "COPY" sturdy.)

COPY & CUT



For more detailed game rules, visit our website @ www.SternPinball.com and click on the "NASCAR®" or "Game Archive"
Pop Bumper Link.

FOLD HERE

Click on card to open the Instruction Card for printing.

IIIII NASCAR A

GARAGE AWARDS: Hit the TEST CAR to open the GARAGE. Enter the garage and follow the instructions on the Dot Display for that mode.

EXTRA BALL: The two ramps award HAULER MILES. Collect HAULER MILES to light the extra ball shot. Extra Ball is also available from the GARAGE AWARDS and SCANNER AWARDS.

MULTIBALL: Complete the DROP TARGETS to light the R-A-C-E shots. Shoot the lit R-A-C-E shots to spell RACE. When all 4 letters in RACE are lit, LOCK will light. Lock 2 balls to light Multiball. Begin Multiball by shooting up the LEFT RAMP.

MULTIBALL JACKPOTS: While in Multiball, shoot the lit Jackpot shots. Shoot the lit BONUS JACKPOT to put balls back on the track. Note that any time a ball is on the race track, you should hit the CAPTIVE BALL to freeze a new Jackpot Value!

CHAMP #1: C-H-A-M-P-#1 LETTERS are awarded from SPEED SHOTS, HARD RACING, ROAD COURSE, VICTORY LAP and are possible from MODE BONUS. Complete C-H-A-M-P-#1 to start CHAMPION CHALLENGE.

HINT: Check Instant Info for CHAMP #1 list!

NASCAR® is a registered trademark of the National Association for Stock Car Auto Racing, Inc. ©2005. All Rights Reserved. Printed in the USA.

755-5186-00-Y USA





Service Menu System

Table of Contents

,		B
6	LEFT RIGHT	TEST"
3	PORTALS	ENTER

\sim	
2000	
DIAG	

Chapter 1, Portals TM Service Menu Introduction	-	9
Service Switch Set (Red, Green & Black Buttons) Access & Use		8
How to Use This SectionPortals™ Service Menu Icon Tree for NASCAR® Pinball		9
Portals [™] Service Menu Icon Tree for NASCAR® Pinball	10-1	1
♦ ExampleQUIT THIS SESSION (Exiting the Portals™ Service Menu) & Problem / Solution Table	12-1 1	13
Chapter 2, Go To Diagnostics Menu (Overview)		
, , ,		
GO TO DIAGNOSTICS MENU		
■ Go To Switch Menu ■■ Switch Test ■■ Active Switch Test ■■ Dedicated Switch Test Switch Matrix Grid & Dedicated Switches	1	6
Switch Matrix Grid & Dedicated Switches Switch Matrix Grid Locations, Typical Switch Wiring & Schematic, Dedicated Switch Schematic	1	17
■ Go To Coil Menu ■■ Single Coil Test ■■ Cycling Coil Test	1	8
Partial Coils Detailed Chart Coil & Flash Lamp Locations, Typical Coil WIring, Bulb Types used for Flash Lamps		
Coil & Flash Lamp Locations, Typical Coil Wiring, Bulb Types used for Flash Lamps Coils Detailed Chart Table	1 2	19 20
♦ Backbox I/O Power Driver Board Detailed Wiring Diagram	2	21
■ Go To Lamp Menu ■■ Single Lamp Test ■■ Test All Lamps ■■ Row & Column Lamp Tests	2	22
 Lamp Matrix Grid Lamp Matrix Grid Locations, Typical Lamp Wiring & Schematic, Bulb Types used for Lamps 	,	າວ
■ Test Flash Lamps ■ Clear Ball Trough	2	23) (1
■ Technician Alerts (Switch Detection and Pinball Detection)	24-2	25
■ Begin Play Test ■ Fire Knocker	2	25
■ Sound / Speaker Test (Speaker Phase Testing) ■ Begin Burn In	2	26
■ Dot Matrix Test (Dot Matrix Display Explained)	26-2	27
■ NASCAR® Diagnostics: Track Test, Truck Test and Car Test		
■ Go To Fuse Table (with Example)	2	:9
■ Dr. Pinball ■■ Coil Flow Chart ■■ Switch Flow Chart ■■ Lamp Flow Chart	3	≀0 }1
Chapter 3, Go To Audits Menu (Overview)		
EARNINGS & STANDARD AUDIT TABLES		
□ GO TO AUDITS MENU		
■ Earnings Audits (01-14)		
■ Standard Audits (01-68)		
■ Feature Audits (01-32) Feature Audits Subject to Change, see the Dot Display for current Feature Audits	3	36
■ Go To Printer Menu ■■ Quick Printout ■■ Full Printout ■■ Reset Printer		
Chapter 4, Go To Adjustments Menu (Overview)		
♦ STANDARD & FEATURE ADJUSTMENT TABLES		
GO TO ADJUSTMENTS MENU	3	9
■ Standard Adjustments (01-52)		
■ Feature Adjustments (01-35) Feature Adj. Subject to Change, see the Dot Display for current Feature Adj	39-4	16
■ Custom Message (Direct Access to Standard Adjustment 31)		
Chapter 5, Go To Installs Menu (Overview)	4	/
GO TO INSTALLS MENU	4	7
■ Install Extra Easy ■ Easy ■ Normal ■ Hard ■ Extra Hard	4	ļ 7
■ Directors Cut ■ 3-Ball ■ 5-Ball ■ \$.50 Competition ■ Free Play Competition ■ Home Play	_	
■ Film Star Reset ■ Novelty ■ Add-A-Ball ■ Install Factory	4	18
■ Film Star Reset ■ Novelty ■ Add-A-Ball ■ Install Factory	49-5	50
Chapter 6, Go To Reset Menu (Overview)	5	,1
☐ GO TO RESET MENU		
■ Reset Coin Audits ■ Game Audits ■ High Scores ■ Grand Champion ■ Credits ■ Factory Re		
■ Reset Coin Audits ■ Game Audits ■ High Scores ■ Grand Champion ■ Credits ■ Factory Re ♦ Example		
Chapter 7, Go To Tournmament Menu		
•		
□ GO TO TOURNAMENT MENU (OPTIONAL USE ONLY)	5	3
♦ TOURNAMENT ADJUSTMENT TABLES & TOURNAMENT AUDIT TABLE Tournament Adjustments (01-17)		
■ Start Tournament ■ Stop Tournament ■ Tournament Prizes ■ Tournament Audits (01-14)	5	.5 6
■ Tournament Audits Continued ■ Sign Messages A-B (Tournie Adj. 16-17)	5	<u>5</u> 7

PortalsTM Service Menu System

INST



Service Switch Set (Red, Green & Black Buttons) Access & Use

The **Service Switch Set** provides access for **three** (3) **functions** available for your use. They are **Volume Menu**, **Service Credits Menu** and **Portals**[™] **Service Menu**. All are accessed separately depending on which colored button (**Red**, **Green** or **Black**) is **pushed first**.

Black

ENTER

Green

CREDITS

RIGHT

PORTALSTM

Red



If Coil & Hashlamp Testing, the Playfield Power Interlock Switch must be pulled out.

The Memory Protect Switch is disabled when the Coin Door is open (required for any changes...)

To access any of these *three (3) functions* you must first open the **Coin Door** (see pictorial above) with the Game in the *Attract Mode* (not already in any Function or Menu stated below).



Function 1, Volume Menu

Pushing the *Red "VOLUME" Button* first, enters the *Volume Menu*. While in this Mode, to **DECREASE** the volume, hold down or depress the **Red "LEFT" Button** until desired the volume is achieved; to **INCREASE** the volume, hold down or depress the **Green "RIGHT" Button** until the desired volume is achieved.

Note: Pushing the **Left** or **Right Flipper Buttons** operates the same as the **Red** or **Green Buttons** of the Service Switch Set, while in this Volume Mode.

Set between **0-31**; Once your adjustments are made, this menu will *automatically exit* a few seconds after the last button depression.



Function 2, Service Credits Menu

Pushing the *Green "SERVICE CREDITS" Button* first, adds *Service Credits* (will not affect your audits as "paid" credits). This is useful for the technician to test games in regular play without affecting the game audits. Each depression adds 1 credit; up to 50 credits can be applied. Std. Adj. 16, Credit Limit, determines this, however, it can be changed from 04-50; for details see Chapter 4 of this Section 3. Once your credits are added, this menu will automatically exit a few seconds after the last button depression.

Note: This function is disabled if **Standard Adjustment 30**, **Free Play**, is set to **YES**. The Service Credits are limited to the Credit Limit in addition to any paid credits present in the game (e.g. If the Credit Limit is 30, and there are 8 paid credits present, only 22 Service Credits can be applied.).





Function 3, Portals™Service Menu

Pushing the *Black "BEGIN TEST" Button* first, enters the *Portals™ Service Menu*. Once in, navigate through all menus depressing the *Red "LEFT"* or *Green "RIGHT" Buttons*.

Note: Pushing the **Left** or **Right Flipper Buttons** operates the same as the **Red** or **Green Buttons** of the Service Switch Set, while in this Service Mode.

Select or *activate* the *Icon* chosen (the *Icon will be "flashing"*) by pushing down or depressing the **Black "ENTER" Button**.

Note: Pushing the **Start Button** operates the same as the **Black Button** of the Service Switch Set, while in this Service Mode.

Please read the remainder of this Chapter for more information on the Portals™ Service Menu. The remaining six (6) Chapters of this Section explains all Icons & Menus in detail. Read! Read!



PortalsTM Service

Menu Introduction



Portals™ Service Menu Introduction

Important: The Dual Switch Bracket holds the Playfield Power Interlock & Memory Protect Switches. It is located just inside the Coin Door frame (see pictorial of the Coin Door on the previous page). The Button Switch at the top is the Playfield Power Interlock Switch. It must be pulled out for electro-mechanical device testing or diagnostic purposes (this is required). If this button is pushed in, the Playfield Power is disabled while the Coin Door is OPEN. The Button Switch at the bottom is the Memory Protect Switch. It is enabled while the Coin Door is CLOSED; meaning any adjustment changes that are made will not be written to memory. If changing adjustments is required, ensure the Coin Door is OPEN to disable this switch, thus allowing for desired changes.

How to Use This Section

This section will cover all functions available in the **Portals**[™] **Service Menu** in a *Step-By-Step* process. This section is divided into chapters which coincide with the **MAIN MENU**. The previous and following pages in this Chapter will instruct the operator on how to move through the Menus. It's simple, easy and fun to use!

To get into the **Service Menu Mode** review **"Function 3, Portals**[™] **Service Menu"** on the previous page. After Power-Up, push down the **Black "BEGIN TEST" Button** to begin. Looking at the display you will momentarily see **"Service Menu"** with a *satellite flying from right to left pulling a banner* **"Portals©**[™] followed by the **MAIN MENU**:



Use the Red "LEFT" & Green "RIGHT" Buttons (or Left & Right Flipper Buttons) to move the selected *Icon* left or right, and the Black "ENTER" Button (or Start Button) to activate the selected *Icon*. The use of the Service Switch Set (Red, Green, & Black Buttons) is required in Switch Test or Active Switch Test, as the Start & Flipper Buttons are a part of this test.

The MAIN MENU now appears with the "DIAG" Icon (GO TO DIAGNOSTICS MENU) flashing:



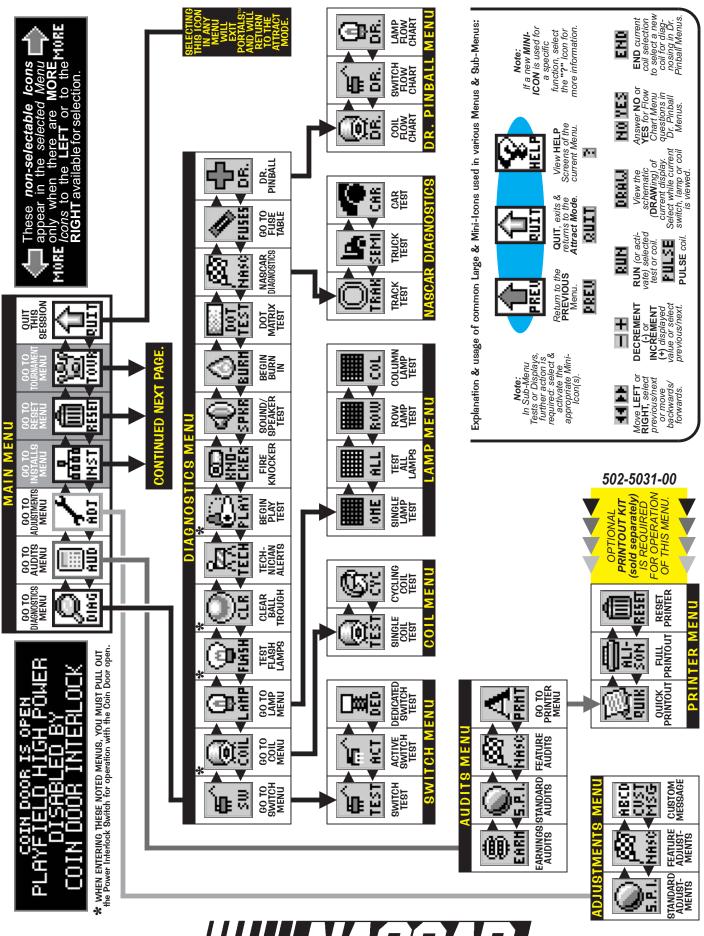
As the operator views the Menu Screen(s), the MORE symbols indicates that there are more *Icons* to select in each direction. The *Icon* selected will blink. Pushing the **Black** "ENTER" Button (or **Start Button**) will select the *Icon* and the Menu Screen will change to the menu selected. Select the "PREV" *Icons* to move backwards through the menu levels. Select the "QUIT" *Icon* to completely exit the Service Mode.

View the **Portals** "Service Menu Icon Tree on the next pages for a complete overview of all menus used in this system. The "HELP" *Icon* & "?" *Mini-Icon* provide explanation of ICON usage in the Menu where the "HELP" *Icon* or "?" *Mini-Icon* was selected. View QUIT THIS SESSION (Exiting the Portals Service Menu) at the end of this chapter (reference Section 3, Chapter 1, Portals Service Menu Introduction).

The **chapters** in this **section**, which coincide with the **MAIN MENU**, will also provide more detailed information. *Use both the manual and the display to help customize, troubleshoot and/or diagnose faults, if any.*



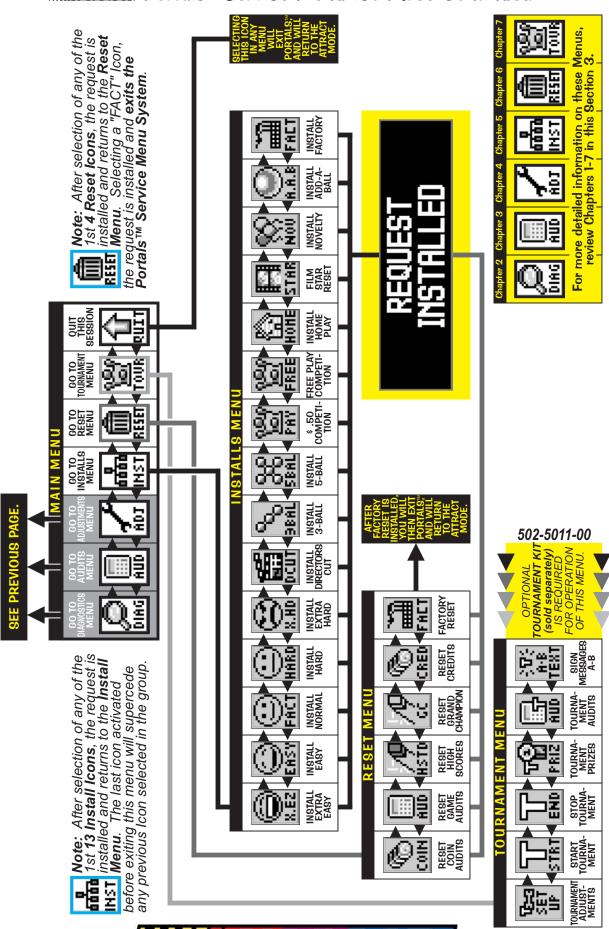




Section 3, Chapter 1 Page 10



PortalsTM Service Menu Introduction



PortalsTM Service Menu Introduction

Section 3, Chapter 1 Page 11

Portals™ Service Menu Example

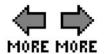
This example will demonstrate activation of *Icons* in the **DIAGNOSTICS MENU**. The example will show activation of the "SW" Icon (GO TO SWITCH MENU). In this menu, the switches can be tested individually and also all active switches can be tested. Use the same technique to access all the *Icons* in the **Portals**[™] **Service Menu**. Follow Portals™ Service Menu Icon Tree on the previous pages as a guide to help navigate through the entire system (Also, go to the chapter in this manual explaining the icon(s) selected.).

If the display is in any other menu other than the MAIN MENU, use the Red "LEFT" & Green "RIGHT" Buttons to select the "PREV" Icon and press the Black "ENTER" Button to activate the ICON thus moving back to the previous menu. Do so until MAIN MENU appears.

Chapters 2 through 7 will cover all menu items within the **Portals** Service Menu. The *Icon* is shown preceding the text. Find the *Icon* in the **Portals** Service Menu by navigating with the **Red** or **Green Buttons**. Each chapter started is from the MAIN MENU. Within the chapter, and Sub-Menu will be covered sequentially with their explanation & function. If the operator "gets lost", select and activate the "PREV" Icon until the display indicates MAIN MENU. For more help on Button Usage, select & activate the "HELP" Icon or "?" Mini-Icons.

EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

Select and activate to:



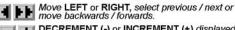












DECREMENT (-) or INCREMENT (+) displayed value or select previous / next.

SE RUN (or us. RUN (or activate) selected test or coil RUM PUL

These non-selectable lcons appear in the selected Menu only when there are MORE Icons to the LEFT or to the RIGHT available for selection.

to return to the PREVIOUS Menu.

Select and activate Select and activate Select and activate to QUIT, exits & returns to the Attract Mode.

to view HELP Screens of the current Menu*.

DRAW View the schematic (DRAWing) of current display. Select while current switch, lamp or coil is viewed.

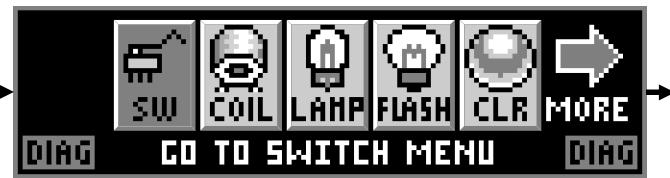
* Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.

Example:

After entering **Portals**[™], the **MAIN MENU** now appears with the "**DIAG"** *lcon* (**GO TO DIAGNOSTICS MENU**) flashing:



Press the Black "ENTER" Button to activate this ICON. The DIAGNOSTICS MENU now appears with the 'SW" Icon (GO TO SWITCH MENU) flashing:

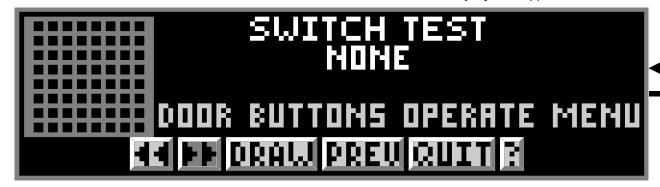




Press the **Black Button** to *activate* this **ICON**. The **SWITCH TEST MENU** now appears with the "TEST" *Icon* (**SWITCH TEST**) flashing:



Press the Black "ENTER" Button to activate this icon. The Switch Test Display now appears.



All switches can be tested one at a time. When possible, use a pinball to close any playfield switches; rolling the ball at Stand-Up Targets or over/under switches is suggested. Use finger for all non-playfield switches. As each switch is closed, the respective Switch Matrix Grid Position (1-64) will be lit.

To view the schematic for the switch selected, press either the **Red** or **Green Button** to select the "DRAW" *Mini-Icon*. Press the **Black Button** to *activate* this *Mini-Icon*; do so while the switch is momentarily closed. This will bring up the **Switch Schematic Display**. The display describes the switch in the Switch Matrix which includes the name of the switch, the Return (Row) Wire and the Drive (Column) Wire, drive transistor, and the "Pin-Outs" from the CPU/Sound Board. *Activating* the "DRAW" *Icon* when a switch is not closed, will give the generic switch schematic as shown below.



To **exit any display where there are no Mini-Icons** (Schematics or Help Displays), **press any button** to return to the previous Menu.

While in **Switch Test** or **Active Switch Test**, the **Flipper & Start Buttons** are deactivated (because they can be part of these tests). Use the **Red "LEFT," Green "RIGHT"** and/or **Black "ENTER" Buttons** to select and activate the "**MINI-ICONS**" at the bottom of the display. In **Switch Test**, if the "<<" or ">>" Mini-Icon is activated, the display will go to (slip between) the previous tests (Active & Dedicated Switch Tests). Use either the **Red** or **Green Button** to select the "PREV" Mini-Icon. Press the **Black "ENTER" Button** to return to **Switch Test Menu**. To exit out of this Sub-Menu, select and activate the "PREV" Icon in the Menu. The **DIAGNOSTICS MENU** now appears with the "SW" Icon (**GO TO SWITCH MENU**) flashing. Go through other **Diagnostics** selections or exit.

To exit the Portals™Service Menu, select & activate the "QUIT" Icon (see the next page).

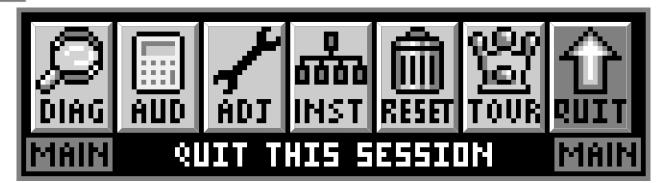
PortalsTM Service Menu Introduction





QUIT THIS SESSION (Exiting the Portals™Service Menu)

In the MAIN MENU and in all SUB-MENUS, if the "QUIT" *Icon* or "QUIT" *Mini-Icon* is selected and *activated*, the Portals™ Service Menu Session will be exited and returned to the *Attract Mode*.





Exiting PortalsTM or turning game on/off will start the *Power-Up Routine*. Upon Power-Up, *HOLD IN THE RIGHT FLIPPER BUTTON* to view the CPU Game & Display Code Versions (+ Check-Sums), followed by the Location & Game ID Numbers and Alerts, if any (see Sec. 3, Chp. 2, GO TO DIAGNOSTICS MENU, Technician Alerts).



The below Problem / Solution Table was designed to answer some common problems frequently asked.

Problem / Solution Table

PROBLEM	SOLUTION
Will not enter the Service Mode after depressing the Black "BEGIN TEST" Button.	 Check the Service Switch(es) (Red, Green & Black Buttons) for loose connections or bad Ground. Check the associated wiring harness to/from the CPU/Sound Board, Connector CN6. Check CPU/Sound Board for possible failure.
All Service Buttons (Red , Green and Black) appear nonfunctional.	Check the Service Switches wiring harness for poor or no connection and/or broken wires.
The Green Service Button in the Attract Mode will not enter the SERVICE CREDITS MENU to add Service Credits.	 Check to make sure the Game is not in "Free Play." If the game is set to Free Play, adding Service Credits is not required. Check the Service Switches wiring harness for poor or no connection and/or broken wires.
The Display "blanks out."	 Check the Dot Matrix Display for loose wiring harness for poor or no connection and/or broken wires. Check F1 (3/4A Fuse) on the Display Power Supply Board. Refer to Section 5, Chapter 4, SCHEMATICS & TROUBLESHOOTING.
Icons "scroll" along continuously in the MAIN MENU.	 Check for a stuck switch on the Green Button. If the Service Switch Set and/or the Coin Door was replaced, ensure the Locking Mechanism on the Green Button was removed. If the Green Button "clicks" and locks into an up/down position, the Green Button has this lock switch. Remove it. (Ref. to Svc. Bulletin #74.)
The Start and Flipper Buttons do not select or activate <i>Icons</i> in the SWITCH TEST MENU .	This is normal. These switches are deactivated, as they are a part of the Switch Test. Use the Red "LEFT" or Green "RIGHT" & Black "ENTER" Buttons in this Sub-Menu. Refer to Section 3, Chapter 2, GO TO DIAGNOSTICS MENU, Switch Test.
Can't move selection of <i>Icon</i> with the Left and/or Right Flipper Buttons .	 Check the Flipper Buttons for loose connections or bad Ground and refer to Section 5, Chapter 2, Playfield Wiring, #-Flipper Circuit Wiring Diagram. This is normal only in Diagnostic's Switch & Active Switch Tests (see previous Problem).
Some <i>lcons</i> appear non-functional in the PRINTER MENU(S) .	• If no printing equipment is connected, the "-" <i>Icon</i> , "+" <i>Icon</i> and "RUN" <i>Icon</i> will appear not to function. Refer Section 3, Chapter 3, GO TO PRINTER MENU.
Some Icons appear non-functional in the GAME SPECIFIC MENU under the DIAGNOSTICS MENU.	• If there is no other test under this Menu, the "<<" & ">>" Mini-Icons will appear not to function. The remaining Icons should function as normal. Note: If there is no "Go To (Game Name) Test(s), the "GAME NAME" Icon will not invoke another display.
The display returns to the ATTRACT MODE exiting the Service Session after a FACTORY RESET.	This is normal. After a FACTORY RESET, the Service Session is automatically exited. Refer to Section 3, Chapter 6, GO TO RESET MENU, Factory Reset.
In COIL TEST MENU , the coils and flashlamps do not fire after activating the "RUN" <i>Icon</i> .	Ensure the POWER INTERLOCK SWITCH is pulled out (see the start of this Chapter).
In ADJUSTMENTS MENU, with the Coin Door CLOSED, adjustments are not getting changed as desired (using the Flipper & Start Buttons).	This is normal. The <i>Memory Protect Switch</i> is enabled when the Coin Door is CLOSED . Changes can be made with the Coin Door OPEN only.
In Portals[™] Service Menu , the volume cannot be adjusted with the Red or Green Buttons .	The Volume adjustment can only be made when in the Attract Mode. The Volume Mode is entered by pressing the Red "VOLUME" Button. Then use the Red "LEFT" to decrease / decrement (-) or Green "RIGHT" Button to increase / increment (+) the volume.
In Portals [™] Service Menu , the display seems to lock up, or the Help Display appears to be non-functional.	• If you cannot clear the situation by exiting back one Menu, exit completely out of the Portals ™ Service Menu , and re-enter. If the problem persists, call Technical Support for additional help.

Section 3, Chapter 1 Page 14



Go To Diagnostics Menu

Overview

The **Portals** Service Menu System provides tests for sounds, display, lamps, switches and coils. Each feature may be tested manually or automatically after entering the **Portals** Service Menu (see Chapter 1 of this Section). Thé automatic tests (e.g. Cycling Coils, Test Flash Lamps) may be used for a quick verification of automatic test functions and the manual tests (Begin Play Test, Single Lamp / All / Row / Column Tests, and 'Game Name' **Tests**) may be used for troubleshooting. All *Icons* and there usages are explained throughout this chapter in order.

Important: Upon Power-Up (Game Reset) or opening the Coin Door watch the Display for any Alerts.*

OPEN THE DOOR

If this display flashes, the game is indicating that CMOS RAM memory (CPU Loc. U212) has been corrupted. This is caused be either failure in memory (e.g. batteries are dead and/or faulty **RAM**) or upon installation of updated version of game code. Opening the Coin Door will initiate a Factory Restore (Reset), by opening the Memory Protect Switch.

Check battery voltage at VBATT Test Point on the CPU/Sound Bd. (more details in Sec. 5, Chp. 4, PCBs).



This *flashing display* is shown immediately upon opening the Coin **Door** as a reminder that **20v/50v DC** power to the playfield is **disabled**. All electro-mechanical devices (such as Coils) cannot be tested with the switch pushed in. PULL OUT the Power Interlock Switch ONLY if you're in a *Testing Menu* requiring power. See *Access & Use* in

Chapter 1 of this Section for the location of this switch. Closing the Coin Door will automatically reset this switch.

OPERATOR ALERT! #2 RUTO LRUMCH COIL MALFUNCTION

This *display* is shown momentarily during Game Mode or Power-Up to alert the operator of a coil malfunction (coil doesn't energize or coil fires a multiple number of times). **OPERATOR ALERT!** works by monitoring any switch activated coil that has the potential to trap a ball when disabled (more details in this Chapter, Technician Alerts, Pages 24-25)



* If this **Tech Report Alert flashes** (along with an audible sound), the game has detected faulty switches and/or missing pinballs. Select the "TECH" Icon for information (review **Technician Alerts**, **Pages 24-25**).

* For this **Alert display** to appear, Standard Adj. **49**, **must be changed** to POWERUP, COIN DOOR or POWERUP AND COIN DOOR, the

default is **NEVER** (review Section 3, Chp. 4, GO TO ADJUSTMENTS MENU, Standard Adjustments, Page 44).

A CAUTION: Remove all pinballs from the Ball Trough prior to lifting the playfield to it's full upright position for servicing. PULL OUT the Power Interlock Switch for operation. To eject pinballs, select the "DIAG" Icon from the MAIN MENU to go to the DIAGNOSTICS MENU, then select the "CLR" Icon to enter the CLEAR BALL TROUGH MENU. Select the "RUN" Mini-Icon and press the Black "ENTER" Button or Start Button to remove one pinball at a time (this feature also useful to retrieve a pinball for game testing in Begin Play Test & Game Specific Tests).

_____ EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

Select and activate to:













Move LEFT or RIGHT, select previous / next or move backwards / forwards.

DECREMENT (-) or INCREMENT (+) displayed value or select previous / next.

RUH PULSE RUN (or activate) selected test or coil PULSE coil. DRAW View the schematic (DRAWing) of current display. Select while current switch, lamp or coil is viewed.

These non-selectable lcons appear in the selected Menu only when there are MORE Icons to the LEFT or to the RIGHT available for selection.

Select and activate to return to the PREVIOUS Menu.

Select and activate to QUIT, exits & to view HELP screens of the

Attract Mode.

current Menu*.

* Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.

GO TO DIAGNOSTICS MENU

explanation & usage of the *lcons* in the **DIAGNOSTICS MENU**.

After entering **Portals**™, the **MAIN MENU** now appears. To initiate, from the **MAIN MENU**, select the "DIAG" *Icon* with either the **Red** "LEFT" or **Green** "RIGHT" Buttons (the Flipper Buttons operates in the same manner) and press the **Black** "ENTER" Button (the **Start Button** operates in the same manner). The **DIAGNOSTICS MENU** appears. Continue through this chapter for the explanation & usage of the Icons in the DIAGNOSTICS MENU. Usage Note: Only in Switch & Active Switch Tests, the Flipper & Start Buttons cannot be used as the alternate navigation buttons as they are a part of these tests. After exiting these tests, the Left & Right Flipper and Start Buttons can once again be used. Continue through this chapter for the

Go To Diagnostics Menu



🛚 Go To Switch Menu

To initiate, from the **DIAGNOSTICS MENU**, select the "SW" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Switches are configured in an 8 x 8 Matrix of Columns (Switch Drives) and Rows (Switch Returns) with up to 64 possible switches. The SWITCH TEST MENU consists of three (3) parts: Switch Test, Active Switches & Dedicated Switch Test. Reminder:

The Flipper & Start Buttons (part of Switch Tests) cannot be used as navigation buttons during these test(s)

舒

Switch Test

To initiate, from the **SWITCH MENU**, select the "TEST" *Icon* with either the **Red** or **Green Buttons** & press the **Black Button**. In **Switch Test**, close each switch and observe the display. The display will describe the switch in the Switch Matrix Grid (below), which includes the switch name, Return (Row) Wire, Drive (Column) Wire and the "Pin-Outs" from the **CPU/Sound Board**. When the switch is closed, the information if displayed momentarily. To view the schematic for the switch selected, press either the **Red** or **Green** Button to select the "DRAW" Mini-Icon. Press the Black Button to activate this Mini-Icon; do so while the switch is momentarily closed. To return to Switch Test, press the Black Button again.

🔁 Active Switch Test

To initiate, from the **SWITCH MENU**, select the "ACT" *Icon* with either the **Red** or **Green Buttons** & press the **Black Button**. If still in a previous test, select the "PREV" *Mini-Icon* to return to **SWITCH MENU** or select either of the "<<" or ">> " Mini-Icons to move through the tests. In Active Switch Test, if any switches are stuck closed *(or made from the presence of a pinball)*, the display sequences through the Switch Names, Return (Row) Wire, Drive (Column) Wire, Drive Transistor, Part Number and the "Pin-Outs" from the CPU/Sound Board. This cycle continues until all switches are cleared or until the test is exited.

Dedicated Switch Test

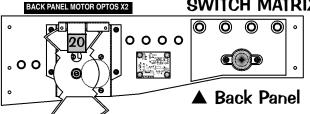
To initiate, from the SWITCH MENU, select the "DED" Icon with either Flipper Button & press the Start Button (the Service Switches are deactivated during this test.). In Dedicated Switch Test, the display will describe the switch which includes the Switch Name, Return (Row) Wire, Drive (Column) Wire, Part Number and the "Pin-Outs" from the CPU/Sound Board.

SWITCH MATRIX GRID & DEDICATED SWITCHES

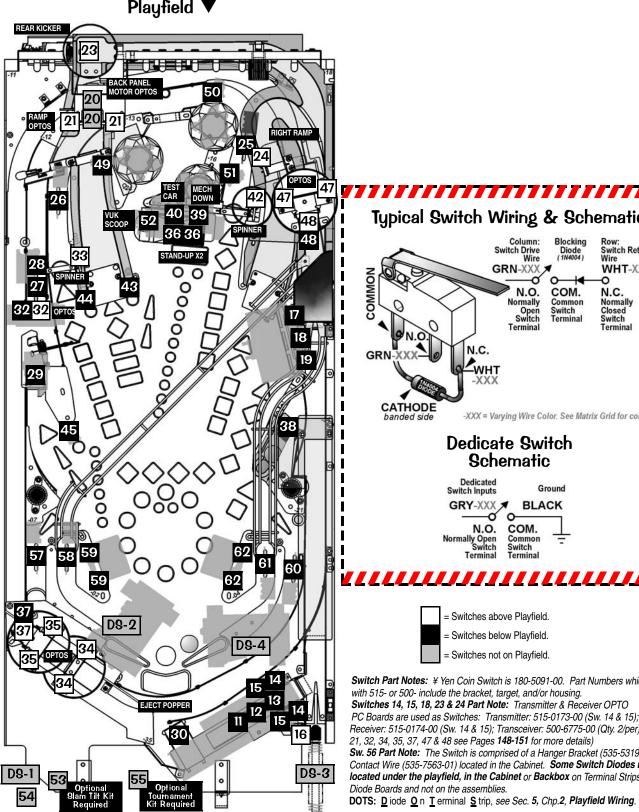
Column (Drive)	1: Q1	2: Q2	3: Q3	4: Q4	5: Q5	6: Q6	7: Q7	8: Q8
Row (Refurn)	GRN-BRN CN5-P1	GRN-RED CN5-P3	GRN-ORG CN5-P4	GRN-YEL CN5-P5	GRN-BLK CN5-P6	GRN-BLU CN5-P7	GRN-VIO CN5-P8	GRN-GRY CN5-P9
1H U400	1 Cabinet Side	9	17 Below P/F	25 Below P/F	Above P/F	41	49 Below P/F	57 Below P/F
WHT-BRN CN7-P9	BUTTON (UK ONLY)	NOT USED	TOP DROP TARGET	RIGHT ORBIT	LEFT SPINNER	NOT USED	LEFT BUMPER	LEFT OUTLANE
Sw. Part Number:	180-5160-01		180-5158-00	500-6227-02	180-5010-04		180-5015-04	500-6227-01
2 : U400		10	18 Below P/F	26 Below P/F		42 Above P/F	50 Below P/F	58 Below P/F
WHT-RED CN7-P8	4TH COIN SLOT	NOT USED	MIDDLE DROP TARGET	LEFT ORBIT	LOWER ACCELERATOR RIGHT (OPTO)	RIGHT SPINNER	RIGHT BUMPER	LEFT RETURN LANE
Sw. Part Number:	180-5204-00		180-5158-00	500-6227-02	See Sw. 34 Note	180-5010-04	180-5015-04	500-6227-02
3: U400			19 Below P/F	27 Below P/F		43 Below P/F	51 Below P/F	59 Below P/F
WHT-ORG CN7-P7	6TH COIN SLOT	4-BALL TROUGH #1 (LEFT)	BOTTOM DROP TARGET	PIT LOCK MIDDLE	LOWER ACCELERATOR MID. (OPTO)	RIGHT STANDUP	BOTTOM BUMPER	LEFT SLINGSHOT
Sw. Part Number:	Future Use	1 <u>80-5119-02</u>	180-5158-00	180-5179-00	See Sw. 35 Note	500-5857-06	180-5015-04	180-5054-00 (x2)
4: U400		12 Below P/F	20 Above P/F	28 Below P/F		44 Below P/F	52 Below P/F	60 Below P/F
WHT-YEL CN7-P6	RIGHT COIN SLOT	4-BALL TROUGH #2	WINDMILL MOTOR OPTO	PIT LOCK TOP	TEST CAR STANDUP X2	CENTER STANDUP	GARAGE VUK	RIGHT OUTLANE
Sw. Part Number:	180-5204-00	180-5119-02	See Sw. 20 Note	180-5178-00	515-5162-06	500-5857-06	180-5116-01	500-6227-02
5: U401		13 Below P/F	21 Backpanel	29 Below P/F	Above/Below	45 Below P/F	53 In Cabinet	61 Below P/F
WHT-GRN CN7-P5	CENTER COIN SLOT / DBA	4-BALL TROUGH #3	LEFT RAMP MAKE OPTO	MIDWAY EJECT &	LOWER ACCELERATOR LEFT (OPTO)	LEFT STANDUP	SLAM TILT (OPT)	RIGHT RETURN LANE
Sw. Part Number:	180-5204-00	180-5119-02	See Sw. 21 Note	180-5116-01	See Sw. 37 Note	<u>5</u> 00-5857-06	180-	<u>5</u> 00-6227-01
6: U401		14 Below P/F	22	30 Below P/F		46	54 In Cabinet	62 Below P/F
WHT-BLU CN7-P3	LEFT COIN SLOT	4-BALL TROUGH VUK OPTO	NOT USED	TRACK EXIT POPPER S	CAPTIVE BALL STANDUP	NOT USED	START BUTTON	RIGHT SLINGSHOT
Sw. Part Number:	180-5204-00	See Sw. 14 Note		180-5116-01	500-5232-06		180-5174-00	180-5054-00 (x2)
7: U401		15 Below P/F		31		47 Above P/F	55 In Cabinet	63
WHT-VIO CN7-P2	5TH COIN SLOT	4-BALL STACKING OPTO	TRUCK RAMP KICKER	NOT USED	CAR MECH DOWN	UPPER ACCELERATOR TOP (OPTO)	TOURNA- MENT START	NOT USED
Sw. Part Number:	Future Use	See Sw. 15 Note	180-5057-00		180-5201-00	See Sw. 47 Note	180-5174-00	
8: U401		16 Above P/F	Above P/F	32 Above/Below	40 Below P/F	48 Above/Below	56 In Cabinet	64
WHT-GRY CN7-P1	RT BUTTON (UK ONLY)	SHOOTER LANE	RIGHT RAMP (TO) DIVERTER	PIT LOCK BOTTOM (OPTO)	CAR	UPPER ACCELERATOR BOT. (OPTO)	BOB IILI	NOT USED
Sw. Part Number:	180-5160-01	180-5200-00	180-5010-04	See Sw. 32 Note	180-5010-04	See Sw. 48 Note	See Sw. 56 Note	



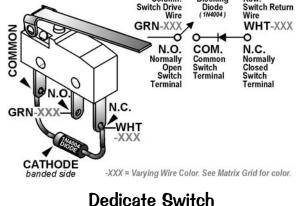




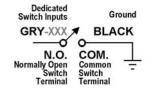




Typical Switch Wiring & Schematic Column: Switch Drive Wire Blocking Row: Switch Return Wire Diode



Dedicate Switch Schematic



 Switches above Playfield. = Switches below Playfield. = Switches not on Playfield.

Switch Part Notes: ¥ Yen Coin Switch is 180-5091-00. Part Numbers which start with 515- or 500- include the bracket, target, and/or housing.

Switches 14, 15, 18, 23 & 24 Part Note: Transmitter & Receiver OPTO PC Boards are used as Switches: Transmitter: 515-0173-00 (Sw. 14 & 15); Receiver: 515-0174-00 (Sw. 14 & 15); Transceiver: 500-6775-00 (Qty. 2/per) (Sw. 20, 21, 32, 34, 35, 37, 47 & 48 see Pages 148-151 for more details)

Sw. 56 Part Note: The Switch is comprised of a Hanger Bracket (535-5319-00) and Contact Wire (535-7563-01) located in the Cabinet. Some Switch Diodes may be located under the playfield, in the Cabinet or Backbox on Terminal Strips or Diode Boards and not on the assemblies.

DOTS: Diode On Terminal Strip, see Sec. 5, Chp.2, Playfield Wiring.

Go To Diagnostics Menu



Go To Coil Menu

To initiate, from the **DIAGNOSTICS MENU**, select the "COIL" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. The coils are listed in groups. Coils **01-16** are

typically High Current Coils (although Low Current Coils may be used in these positions & will be noted). Coils 17-32 are typically Low Current Coils. Flash Lamps are typically used in positions 25-32 (although may be used in any position & will be noted).

COIN DOOR IS OPEN PLAYFIELD HIGH POWER DISABLED BY COIN DOOR INTERLOCK

PULL OUT the Power Interlock Switch for operation with the Coin Door open.

Important: The Partial Coils Detailed Chart Table is used as a reference against the Coil & Flash Lamp Locations on the next page. For the complete Coils Detailed Chart Table, see the reverse of the following page. The Chart is shown to compare against the Backbox I/O Power Driver Board Detailed Wiring Diagram (shown again in Sec. 5, Chapter 1, Playfield Wiring). For more on troubleshooting and diagnosing, see Sec. 5, Chapter 4, Printed Circuit Boards.

Single Coil Test

To initiate, from the **COIL MENU**, select the "TEST" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. Ensure the **Power**

Interlock Switch is pulled out. Select either the "-" or "+" Mini-Icons. Start with the "+" Mini-Icon to start the manual Single Coil Test from #1 (the test runs through all Coils and Flash Lamps #1-#32 & Optional UK Only Auxiliary Positions AUX 1-3). Press the Black Button on the "+" Mini-Icon, as each coil is selected, the display will describe the Coil or Flash Lamp Name with the corresponding number, the wire with colors, the "Pin-Outs" from the I/O Power Driver Board, the Coil Voltage and Gauge-Turns (e.g. 23-800). Press the Black Button again to move forward in the test. To test and view a particular Coil or Flash Lamp, select the "RUN" Mini-Icon and press the Black Button. Each time the Black Button is pushed, the Coil or Flash Lamp will fire on the Playfield and/or Backbox, with the display indicating the Coil or Flash Lamp information. Continue with the same procedure to run through the entire test.



Cycling Coil Test

To initiate, from the **COIL MENU**, select the "CYC" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. If still in a previous test,

select the "PREV" *Mini-Icon* to return to **COIL MENU** or select either of the "<<" or ">>" *Mini-Icons* to move to **Cycling Coil Test** (selecting again will return to **Coil Test**). The test pulses each regular Coil or Flash Lamp sequentially (cycling) on the Playfield and in the Backbox (if Coils are used). The display indicates **CYCLING COILS**.

U Coil Note: U Either -00B or -00T can be used for coil replacements. B/T listed is preferable for easier diode access & may differ on game.

PARTIAL COILS DETAILED CHART ...

	High Current Coils Group 1	Drive Transistor	Coil GA-Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	26-1200 O
#2	AUTO LAUNCH	Q2	24-940 U
#3	TRUCK RAMP KICKER	Q3	23-800 U
#4	TRUCK MOTOR DRIVE (20V)	Q4	Motor 20v 041-5093-00
#5	GARAGE RELEASE	Q5	23-800 U
#6	GARAGE KICKER	Q6	23-800 U
#7	TRACK EXIT POPPER	Q7	23-800 U
#8	MIDWAY EJECT	Q8	26-1200 ひ 090-5044-00T

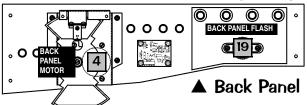
	High Current Coils Group 2	Drive Transistor	Coil GA-Turn or Bulb Type		
#9	LEFT BUMPER	Q9	26-1200 O		
#10	RIGHT BUMPER	Q10	26-1200 U		
#11	BOTTOM BUMPER	Q11	26-1200 U		
#12	3 BANK (DROP TARGET) RESET	Q12	25-1240 U 090-5034-00B		
#13	RIGHT RAMP DIVERTER	Q13	32-1800 ひ 090-5031-00		
#14	GARAGE RAISE	Q14	22-1080 ひ 090-5032-00T		
#15	LEFT FLIPPER (50v RED/YEL)	Q15	23-1100 ひ 090-5030-00T		
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	23-1100 U 090-5030-00T		

	Low Current Coils Group 1 Tra	Drive ensistor	Coil GA-Turn or Bulb Type
#17	LEFT SLINGSHOT	Q17	23-800 O
#18	RIGHT SLINGSHOT	Q18	23-800 U
#19	FLASH: UPR RIGHT (BACK PANEL)	Q19	#89 Bulb 165-5000-89
#20	UPR ACCELERATOR MAG (AUX)	Q20	22-700 U
#21	RIGHT TRACK EXIT DIVERTER	Q21	26-1200 U
#22	LEFT TRACK EXIT DIVERTER	Q22	26-1200 ひ 090-5044-00T
#23	INNER ORBIT POST	Q23	26-1200 ひ 090-5044-00T
#24	OPTIONAL COIL	Q24	Opt. 5v
	Diode On Terminal Strip (if noted)		

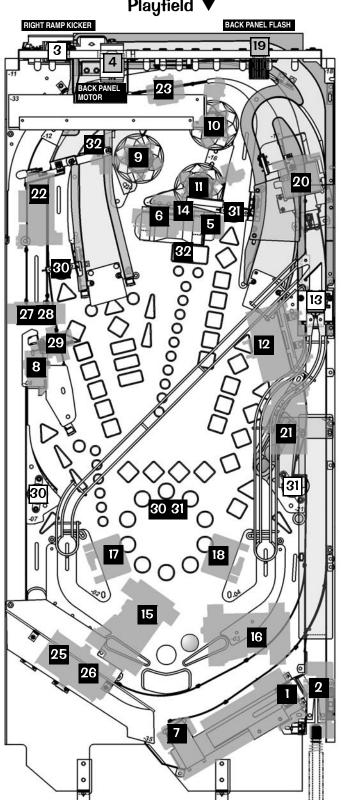
	Diode On Terminal Strip (if noted)		
	Low Current Coils Group 2	Drive Transistor	Coil GA-Turn or Bulb Type
#25	LWR ACCLRTR MAG LT (AUX)	Q25	22-700 O
#26	LWR ACCLRTR MAG RT (AUX)	Q26	22-700 ひ 090-5071-00
#27	PIT LOCK RELEASE LEFT	Q27	26-1200 O
#28	PIT LOCK RELEASE RIGHT	Q28	26-1200 O 090-5044-00T
#29	MIDWAY SIGN (HOT DOG)	Q29	32-1800 ひ 090-5031-00
#30	FLASH: LEFT X3	Q30	#89 Bulb 165-5000-89
#31	FLASH: RIGHT X3	Q31	#89 Bulb 165-5000-89
#32	FLASH: TEST CAR X2	Q32	#89 Bulb 165-5000-89

	Auxiliary (UK ONLY)	Drive ransistor	Coil GA-Turn
	AUX 1: LEFT UP/DOWN POST	Q1	26-1200 O
H	AUX 2: CENTER UP/DOWN POST	Q2	23-1100 O
	AUX 3: RIGHT UP/DOWN POST	Q3	26-1200 ひ 090-5044-00T

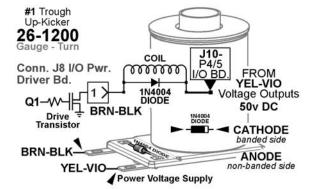




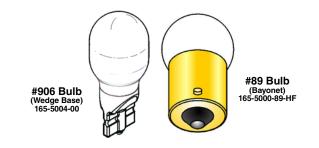




Typical Coil Schematic & Wiring



Bulb Types used for Flash Lamps



= Coils / Flash Lamps above Playfield.

= Coils / Flash Lamps below Playfield. = Coils / Flash Lamps not on Playfield.

Color = Color of Mini-Mars of Flash Lamp Bulb.

Some Coil or Flash Lamp Diodes may be located under the playfield, in the Cabinet or Backbox on Terminal Strips or Diode Boards and not on the assemblies. DOTS: <u>D</u> iode <u>O</u> n <u>T</u> erminal <u>S</u> trip See Section 5, Chapter 2, Playfield Wiring.

Coil Q24 is Optional. If either a Coin Meter, Token Dispenser or Knocker (all optional equipment) is required, call Technical Support for more information, 1-800-542-5377 or 1-708-345-7700.

Go To Diagnostics Menu







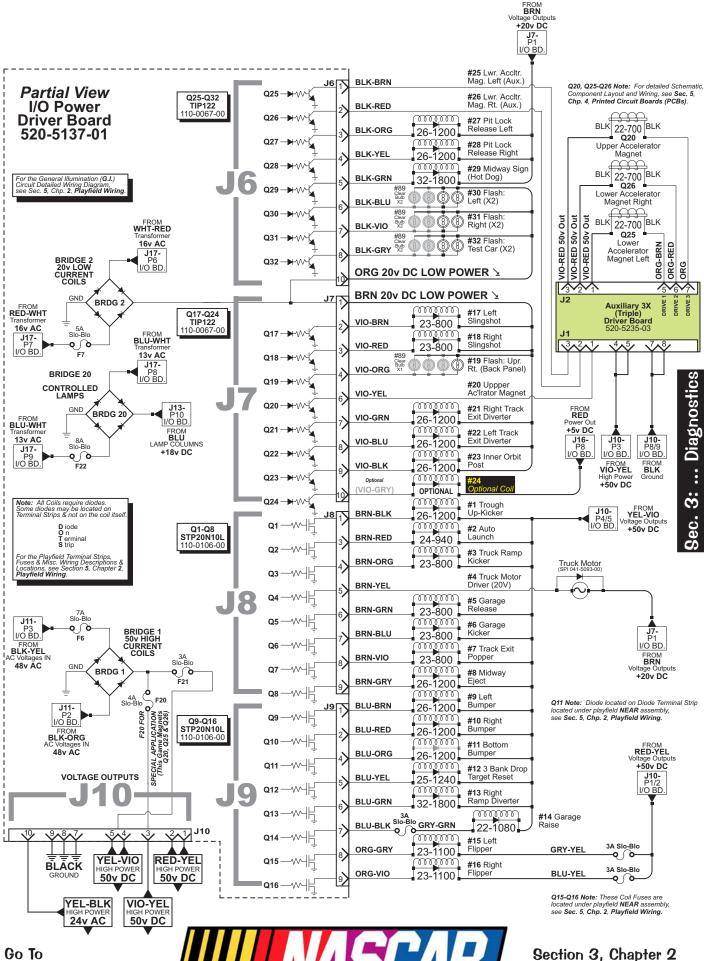


COILS DETAILED CHART TABLE									
	High Current Coils Group 1 Tra	Drive	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1		YEL-VIO	J10-P4/5	50v DC	BRN-BLK	J8-P1	26-1200 ひ 090-5044-00T
#2	AUTO LAUNCH	Q2	I/O Power Driver	YEL-VIO	J10-P4/5	50v DC	BRN-RED	J8-P3	24-940 O
#3	TRUCK RAMP KICKER	Q3		YEL-VIO	J10-P4/5	50v DC	BRN-ORG	J8-P4	23-800 U 090-5001-00B
#4	TRUCK MOTOR DRIVE (20V)	Q4		BROWN	J7-P1	20 _v DC	BRN-YEL	J8-P5	Motor 20v 041-5093-00
#5	GARAGE RELEASE	Q5		YEL-VIO	J10-P4/5	50v DC	BRN-GRN	J8-P6	23-800 ひ 090-5001-00T
#6	GARAGE KICKER	Q6	_	YEL-VIO	J10-P4/5	50v DC	BRN-BLU	J8-P7	23-800 ひ 090-5001-00T
#7	TRACK EXIT POPPER	Q7	•	YEL-VIO	J10-P4/5	50 _v DC	BRN-VIO	J8-P8	23-800 ひ 090-5001-00T
#8	MIDWAY EJECT	Q8	·	YEL-VIO	J10-P4/5	50 _v DC	BRN-GRY	J8-P9	26-1200 ひ 090-5044-00T
	High Current Coils Group 2	Drive	Driver	Power Line	Power Line	Power	Drive Transistor	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
	LEFT BUMPER	nsistor Q9	Ouput Board	Color YEL-VIO	J10-P4/5	Voltage 50v DC	Control Line Color BLU-BRN	J9-P1	or Bulb Type 26-1200 ひ
#9	RIGHT BUMPER								090-5044-00T 26-1200 ひ
#10	D	Q10	A	YEL-VIO	J10-P4/5	50v DC	BLU-RED	J9-P2	090-5044-00T 26-1200 ひ
#11		Q11	I/O		J10-P4/5	50v DC	BLU-ORG	J9-P4	090-5044-NL 25-1240 ひ
#12	3 BANK (DROP TARGET) RESET	Q12	Power	YEL-VIO	J10-P4/5	50v DC	BLU-YEL	J9-P5	090-5034-00B 32-1800 ひ
#13	RIGHT RAMP DIVERTER	Q13	Driver	YEL-VIO	J10-P4/5	50v DC	BLU-GRN GRY-GRN~3A	J9-P6	090-5031-00 22-1080 U
#14	GARAGE RAISE	Q14	▼	YEL-VIO GRY-YEL~3A	J10-P4/5	50v DC	Fuse~BLU-BLK	J9-P7	090-5032-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15 Q16		Fuse~RED-YEL BLU-YEL~3A	J10-P1/2	50v DC	ORG-GRY	J9-P8	090-5030-00T
#16	#16 RIGHT FLIPPER (50v RED/YEL)			Fuse~RED-YEL	J10-P1/2	50v DC	ORG-VIO	J9-P9	090-5030-00T
	Low Current Coils Group 1 Tra	Drive ensistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#17	LEFT SLINGSHOT	Q17		BROWN	J7-P1	20v DC	VIO-BRN	J7-P2	23-800 ひ 090-5001-00T
#18	RIGHT SLINGSHOT	Q18	•	BROWN	J7-P1	20v DC	VIO-RED	J7-P3	23-800 ひ 090-5001-00T
#19	FLASH: UPR RIGHT (BACK PANEL)	Q19		ORANGE	J6-P10	20v DC	VIO-ORG	J7-P4	#89 Bulb 165-5000-89
#20	UPR ACCELERATOR MAG (AUX)	Q20	I/O Power	VIO-RED~Triple Aux~VIO-YEL	J2-P3~Triple Aux~J10-P3	50v DC	ORG~Triple Aux~VIO-YEL	J2-P7~Trp. Aux~J7-P6	22-700 ひ 090-5071-00
#21	RIGHT TRACK EXIT DIVERTER	Q21	Driver	BROWN	J7-P1	20v DC	VIO-GRN	J7-P7	26-1200 ひ 090-5044-00T
#22	LEFT TRACK EXIT DIVERTER	Q22	•	BROWN	J7-P1	20v DC	VIO-BLU	J7-P8	26-1200 ひ 090-5044-00T
#23	INNER ORBIT POST	Q23	•	BROWN	J7-P1	20v DC	VIO-BLK	J7-P9	26-1200 O
#24	OPTIONAL COIL	Q24		RED	J16-P7	5v DC	VIO-GRY	J7-P10	Opt. 5v
	Diode On Terminal Strip (if noted) Low Current Coils Group 2 Tra	Drive	Driver Ouput Board	Power Line	Power Line Connection	Power	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn
#25	LWR ACCLRTR MAG LT (AUX)	nsistor Q25	Ouput Board	Color VIO-RED~Triple	J2-P1~Triple	Power Voltage	ORG-BRN~Triple	J2-P5~Triple	or Bulb Type 22-700 ひ
#26	LWR ACCLRTR MAG RT (AUX)	Q26		Aux~VIO-YEL VIO-RED~Triple	Aux~J10-P3 J2-P2~Triple	50. DC	Aux~BLK-BRN ORG-RED~Triple	J2-P6~Triple	090-5071-00 22-700 ひ
#27	PIT LOCK RELEASE LEFT	Q27	A	Aux~VIO-YEL BROWN	Aux~J10-P3 J7-P1	20v DC	Aux~BLK-RED BLK-ORG	Aux.~J6-P2 J6-P3	090-5071-00 26-1200 ひ
#28	PIT LOCK RELEASE RIGHT	Q28	I/O	BROWN	J7-P1	20v DC	BLK-YEL	J6-P3	090-5044-00T 26-1200 ℧
#29	MIDWAY SIGN (HOT DOG)	Q29	Power	BROWN	J7-P1	20v DC	BLK-TEL BLK-GRN	J6-P5	090-5044-00T 32-1800 ひ
	FLASH: LEFT X3	Q29 Q30	Driver ▼	ORANGE	J6-P10	20v DC	BLK-BLU	J6-P6	090-5031-00 #89 Bulb
#31	FLASH: RIGHT X3	Q31		ORANGE	J6-P10	20v DC	BLK-VIO	J6-P7	165-5000-89 #89 Bulb
	FLASH: TEST CAR X2	Q32		ORANGE	J6-P10	20v DC	BLK-VIO BLK-GRY	J6-P7	165-5000-89 #89 Bulb
π3 ∠	Note: In Test Flash Lamps Menu ("Fl	ash" Icc		sted are all Flash L	amps located b	etween Q	1-Q32 (This Game:	Q19, Q30-Q32	165-5000-89 2)
	Auxiliary (UK ONLY) _{Tra}	Drive ensistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn
	AUX 1: LEFT UP/DOWN POST	Q1	UK 3X	BROWN	J7-P1	20 _v DC	WHITE	J2-P3	26-1200 ひ 090-5044-00T
	AUX 2: CENTER UP/DOWN POST	Q2	Trans. Driver	BROWN	J7-P1	20v DC	RED	J2-P4	23-1100 O 090-5030-00T
	AUX 3: RIGHT UP/DOWN POST	Q3	Board	BROWN	J7-P1	20v DC	ORANGE	J2-P7	26-1200 ひ 090-5044-00T

AUX 3: RIGHT UP/DOWN POST Q3 Board BROWN J7-P1 20v DC ORANGE J2-P7 26-1200 C OS Coil Note: © Either -00B or -00T can be used for coil replacements. B/T listed is preferable for easier diode access & may differ on game.



Diagnostics Menu



Section 3, Chapter 2
Page 21

Go To Lamp Menu

To initiate, from the **DIAGNOSTICS MENU**, select the "LAMP" lcon with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Controlled lamps are configured in and 8 x 10 Matrix of Columns (Lamp Drives) and Rows (Lamp Returns) with up to 80 lamps possible. The Lamp Test Menu consists of four (4) parts: Single Lamp Test, Test All Lamps, Row Lamp Test & Column Lamp Test.

Single Lamp Test

To initiate, from the **LAMP MENU**, select the "ONE" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. Select either the "-" or "+" *Mini-Icons*. Start with the "+" *Mini-Icon* to start the manual **Single Lamp Test** from Column 1, Row 1, Lamp 1. Press the **Black Button** on the "+" *Mini-Icon*, as each lamp is selected, the lamp will light at it's location on the playfield as well as the display, indicating the Lamp Matrix Grid Position (below), lamp name with the corresponding number, Return (Row) Wire & Color, Drive (Column) Wire & Color, and associated drive transistors. Press the **Black Button** again to move forward in the test. To test and view a particular lamp, select the "RUN" *Mini-Icon* and press the **Black Button**. Each time the Black Button is pushed, the lamp will light-up on the playfield, with the display indicating the lamp information.

Continue with the same procedure to run through the entire test. (TIP FOR THIS GAME ONLY: TO VIEW SINGLE)

LAMPS 1 AT A TIME AROUND THE PLAYFIELD IN LOGICAL GROUPS, HOLD THE LEFT FLIPPER BAT UP

(NOT THE BUTTON, BUT THE BAT ITSELF) BEFORE SELECTING THE "ONE" ICON. ONCE SELECTED, YOU CAN

LET GO OF THE FLIPPER BAT AND PROCEDE TO SELECT THE "+" MINI-ICON WITH THE BLACK BUTTON.

Test All Lamps

To initiate, from the LAMP MENU, select the "ALL" Icon with either the Red or Green Buttons and press the Black Button. If still in Single Lamp Test (or any 1 of the 4 tests), select the "PREV" Mini-Icon to return to LAMP MENU or select either of the "<<" or ">>" Mini-Icons to move through the tests, keep activating until Test All Lamps is displayed. The display will indicate ALL LAMPS ON and the lamps on the playfield will be lit, alternating between the rows in the Lamp Matrix Grid.



Row & Column Lamp Tests

To initiate, from the LAMP MENU, select the "ROW" or "COL" Icon with either the Red or Green Buttons and press the Black Button. If still in a previous test, select the "PREV" Mini-Icon to return to LAMP MENU or select either of the "<<" or ">>" Mini-Icons to move

through the tests, keep activating until Row or Column Lamp Test (whichever desired) is displayed. In this test, each set of Jamps in each Row or Column of the Lamp Matrix Grid (respective to each test) will light-up on the playfield and is indicated in the display.

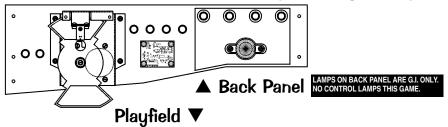
LAMP MATRIX GRID*

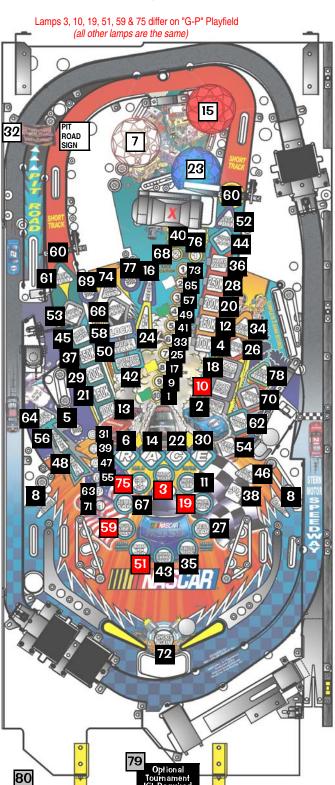
Column (18v)	1: U17	2: U16	3: U15	4: U14	5: U13	6: U12	7: U11	8: U10
Row (Ground)	YEL-BRN J13-P9	YEL-RED J13-P8	YEL-ORG J13-P7	YEL-BLK J13-P6	YEL-GRN J13-P5	YEL-BLU J13-P4	YEL-VIO J13-P3	YEL-GRY J13-P1
1: Q33	1 #44 Clear Bulb	2 #555 Clear Bulb	3 #555 Clear Bulb	4 #555 Clear Bulb	5 #555 Clear Bulb	6 #555 Clear Bulb	7 #555 White LED	8 #555 Clear Bulb
RED-BRN J12-P1	RACE POSITION 10	VICTORY LAP	HAPPY HOUR*	100K	STANDUP LEFT	(R)ACE	LEFT POP	SPECIAL & MILLIONS
2: Q34	9 #555 Clear Bulb	10 #555 Clear Bulb	11 #555 Clear Bulb	12 #555 Clear Bulb	13 #555 Clear Bulb	14 #555 Clear Bulb	15 #555 White LED	16 #555 Clear Bulb
RED-BLK J12-P2	RACE POSITION 9	ROAD COURSE*	INFIELD PARTY	150K	100K	R(A)CE	RIGHT POP	GARAGE
3: Q35	#44 Clear Bulb	18 #555 Clear Bulb	19 #555 Clear Bulb	20 #555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb		#555 Clear Bulb
RED-ORG J12-P3	RACE POSITION 8	2X HAULER MILES	SHORT TRACK*	200K	150K	RA(C)E	BOTTOM B POP IS	FUEL
	#555 Clear Bulb	#555 Clear Bulb	#44 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	#44 Clear Bulb	#44 Yellow Bulb
RED-YEL J12-P4	RACE POSITION 7	COLLECT R-A-C-E	TEST CAR	250K	200K	RAC (E)	(C) HAMP #1	PIT ROAD SIGN
5: Q37	#44 Clear Bulb	34 #555 Clear Bulb	35 #555 Clear Bulb	36 #555 Clear Bulb	37 #555 Clear Bulb	#555 Clear Bulb	39 #44 Clear Bulb	40 #44 Clear Bulb
RED-GRN J12-P5	RACE POSITION 6	JACK POT	HAULER RIDE	HARD RACING	250K	SPIN	C (H) AMP #1	MOVE UP
6: Q38	#555 Clear Bulb	42 #555 Clear Bulb	43 #555 Clear Bulb	44 #555 Clear Bulb	45 #555 Clear Bulb	46 #555 Clear Bulb	47 #44 Clear Bulb	48 #555 Clear Bulb
RED-BLU J12-P6	RACE POSITION 5	BONUS JACKPOT	LIGHT EXTRA BALL	COLLECT R-A-C-E	SPEED SHOTS	JACK POT	CH (A) MP #1	CHAMP #1
7: Q39	49 #44 Clear Bulb	50 #555 Clear Bulb	51 #44 Clear Bulb	52 #555 Clear Bulb	#555 Clear Bulb	54 #555 Clear Bulb	#44 Clear Bulb	#555 Clear Bulb
RED-VIO J12-P8	RACE POSITION 4	MULTI BALL	BUMP 'N RUN*	JACK POT	COLLECT R-A-C-E	EXTRA BALL	CHA (M) P #1	SCANNER
8: Q40	#555 Clear Bulb	#555 Clear Bulb	59 #555 Clear Bulb	60 #44 Clear (X2)	#555 Clear Bulb	#555 Clear Bulb	#44 Clear Bulb	#555 Clear Bulb
RED-GRY J12-P9	RACE POSITION 3	LOCK	RIGHT SIDES ONLY*	SPINNERS X2 (@ MAX)	JACK POT	MODE BONUS	CHAM (P) #1	JACK POT
9: Q41	#44 Clear Bulb	#555 Clear Bulb	67 #555 Clear Bulb	68 #555 Clear Bulb	69 #555 Clear Bulb	70 #555 Clear Bulb	71 #44 Clear Bulb	72 #555 Clear Bulb
RED-WHT J12-P10	RACE POSITION 2	COLLECT R-A-C-E	SUPER FAN	2 TO GO	LEFT RAMP STANDUP (LEFT)	COLLECT R-A-C-E	CHAMP (#1)	SHOOT AGAIN
10: Q42	#555 Clear Bulb	74 #555 Clear Bulb	75 #555 Clear Bulb	76 #555 Clear Bulb	#555 Clear Bulb	78 #555 Clear Bulb	79 OPTIONAL	80 #555 Clear Bulb
RED J12-P11	RACE POSITION 1	JACK POT	GAS 'N GO*	1 TO GO	LEFT RAMP STANDUP (RT)	SUPER JACK POT	TOURNAMENT BUTTON	START BUTTON

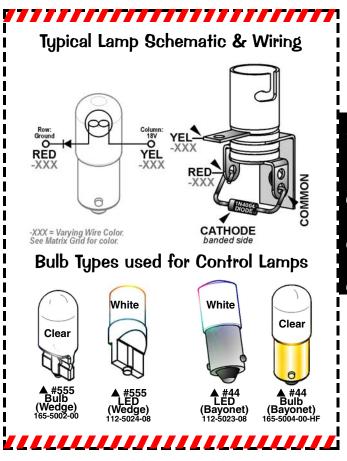
Lamps 3, 10, 19, 51, 59 & 75 differ on "G-P" Playfield (all other lamps are the same)



LAMP MATRIX GRID LOCATIONS







= Lamps which differ on "G-P" Playfield
(all other lamps are the same)
= Lamps above Playfield.
= Lamps below Playfield.
= Lamps not on Playfield.

Lamp Part Notes: #555 Wedge Base (W.B.) Bulb Clear = 165-5002-00.
#44 Bulb (Hvy. Fil.) Clear = 165-5000-44-HF. #555 LED W.B. White = 112-5024-08
See Section 4, Chapter 1, Parts Identification & Location, Pages 72-74 for more details on bulbs and corresponding sockets.

Some Lamp Diodes may be located under the playfield, in the Cabinet or Backbox on Terminal Strips and not on or with the Lamp Socket.

DOTS: Diode On Terminal Strip, see Sec. 5, Chapter 2, Playfield Wiring.

Go To Diagnostics Menu



Test Flash Lamps

To initiate, from the **DIAGNOSTICS MENU**, select the "FLASH" loon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. After selecting this

Icon the display will indicate CYCLING FLASHERS. The Flash Lamps will cycle continuously until the test is exited. This test allows the

technician to easily spot any burned-out bulbs and replace them. Flashers tested are Flash Lamps in Positions: Q1-Q32 and in this game Flash Lamp(s) are: Q19 & Q30-Q32.



PULL OUT the Power Interlock Switch for operation with the Coin Door open.

Clear Ball Trough

To initiate, from the **DIAGNOSTICS MENU**, select the "CLR" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. This Menu is provided

to allow the technician a simple method of removing the balls from the trough and also, to test functionality of the trough, ensuring proper trough operation. After selecting this *lcon* the display will show a graphic

DISABLED BY COIN DOOR INTERLOCK PULL OUT the Power Interlock Switch for operation with the Coin Door open.

of the ball trough with balls in the trough with it's corresponding switch number. Select the "RUN" Mini-Icon to eject the ball in the first position. Simultaneously, the display and the playfield will eject the ball to the Trough Up-Kicker, eject from the Trough Up-Kicker into the Shooter Lane and will be ejected onto the playfield where the technician can easily retrieve the pinball or allow the ball(s) to re-enter the trough to continue Clear Ball Trough A CAUTION: Continuous use of above test may overheat the Trough Up-Kicker Coil. A



Technician Alerts

To initiate, from the DIAGNOSTICS MENU, select the "TECH" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. This Menu is provided to show any switch probl

ems and/or missing pinballs.

After selecting this *Icon*, and if any of the below criteria is met, the display will indicate *any or all* of the following categories: POSSIBLY BROKEN SWITCH, CHECK SWITCHES and/or HYPERSENSITIVE SWITCH (Sw. #16, Shooter Lane, is used as an example). If more than one switch is reported, the Switch Number and Name will cycle within the category, and then will cycle the categories. To return to the DIAGNOSTICS MENU, select the "PREV" Mini-Icon and press the Black "ENTER" Button.

Switch Detection

During game play, activation of switches are monitored. In programming, every switch is given a minimum & maximum value based on the game. The switches are monitored every 5 minutes of game play with a "sliding window" of 15 minutes. If a switch is determined to be faulty, game play is compensated.

PLAYFIELD STATUS POSSIBLY BROKEN SWITCH #02 SHOOTER LAME REPROPERTY:

• Switches noted as **POSSIBLY BROKEN SWITCH** should be checked then adjusted or replaced. Important: A switch reported as "possibly broken" may actually be an unused switch due to lack of usage and not because they're broken. This can happen, if a switch is located in a "hard" shot position, and the players are not making the shot. Game programming will still compensate for this unplayed switch.

CHECK SWITCHES **#**02 SHOOTER LAME PREUIQUITIS

• Switches noted as **CHECK SWITCHES** are determined to be stuck closed or open depending on switch usage. Free up the switch actuator adjust or replace if necessary.



• Switches noted as **HYPERSENSTIVE SWITCH** means just that, the switch should be readjusted or replaced, if necessary.

Determination of switch usage can be checked in Audits (review Section 3, Chapter 3, GO TO AUDITS MENU). Find the associated Audit with the switch in question and check usage; compare it to commonly used switches for comparison. After any switch is checked and repaired or replaced, it's suggested to test the switch in the PLAY TEST MENU (see the next page) or Single Coil Test (reviewed earlier in this chapter, Page 18) where the associated coil to the switch can be tested as well. After correcting the problem, the switch will still be reported until the game is played and the switch is again monitored as specified above. Only you can determine if a switch getting reported is bad or if the switch is currently not getting actuated during game play.

Technicians Alerts continued on the next page.





Technician Alerts Continued

Pinball Detection

While in Technician Alerts Menu, if the following is displayed, the game has detected one (1) or more pinball(s) missing and has compensated for the lost pinball(s) to provide normal game play.



Important: Determine where the pinball is! Do not add pinball(s) until it is determined the pinball(s) are indeed missing & not just stuck. If pinball(s) are added, & if the original stuck pinball has freed itself, the pinball game will not operate properly with the extra pinball(s). When the pinball is recovered, the above display will not appear the next time **Technician Alerts** is visited (a game must be played for the pinball to be determined as found).

During game play, a ball can get trapped or stuck. If after approximately 15 seconds of inactivity or "no scoring," **Ball Search** is started. **Note:** If the pinball is in the Plunger Lane or "held" on the flipper, no **Ball Search** will be performed. The game will perform one **Ball Search** in an attempt to "find" or free-up the pinball.

If the game does not see a switch closure (indicating the pinball has not been found), this display will appear with a count-down timer of 20 seconds, during which Ball Search will continue until the timer runs out (this feature will not happen if the game is in Competition Mode; Ball Search will continue until the pinball is found, unstuck and/or replaced

manually). The display will momentarily acknowledge the missing pinball(s). The game will provide another pinball into play and will compensate for the lost pinball. Game play will appear normal.

Note: This detection and compensation will happen with every pinball, if each suffers the same fate of a ball trap. If all balls get trapped, the game cannot be played or started until the situation is rectified.

Tech Report Alert Option

This game has the capability of automatically alerting the operator upon Power-Up and/or opening the Coin Door if any switch problems and/or missing pinballs has occurred. Review Section 3, Chapter 4, GOTO **ADJUSTMENTS MENU**, Standard Adjustments. The Standard Adjustment to change is 49. The default for this feature is NEVER. The options are: POWERUP, COIN DOOR or POWERUP AND COIN DOOR.

PORTALS->DIAG->TECH

Upon **Power-Up** (Game Reset) and/or opening the **Coin Door** (depending on the option selected), this display will flash three (3) times along with an audible sound. To find out the problem, enter this **Technicians Alert Menu** and wait for the displays.

Note: Coils are not reported in Technician Alerts, h o w e v e r, if a faulty switch is the culprit, the switch will then be reported. The below display is shown momentarily during Game Mode or Power-Up to alert the opérator of a coil malfunction (coil doesn't energize or coil fires a multiple number of times). " OPERATOR ALERT!" works by

OPERATOR ALERT! #2 RUTO LRUNCH COIL MALFUNCTION

monitoring any switch activated coil that has the potential to trap a ball when disabled (e.g. in the Auto Launch, Scoop, Eject, etc.). This alert can also appear if a switch associated with a coil (example shown is #2 Auto Launch) is stuck closed (caused by a switch jam or stuck ball); the CPU/Sound Board will activate the coil approximately ten times and if the switch remains closed, the game will report this switch in **Technician Alerts** as **CHECK SWITCHES**. The display alert "**PLEASE CHECK TECH REPORT**" will be shown (**o n I y i f** POWERUP, COIN DOOR or POWERUP AND COIN DOOR is selected in Standard Adjustment 49).

Begin Play Test

To initiate, from the DIAGNOSTICS MENU, select the "PLAY" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. After selecting this Icon the technician can test certain play functions to insure all switch activated coils function without entering game play. For example, by rolling the ball over the Shooter Lane Sw., the Autoplunger should fire. If it kicks to early or too late,

the switch actuator should be adjusted to compensate for this error. If it fails to fire, use the Switch Test or Coil Test to help determine the cause of the failure. During this Play Test, check all coil assemblies with related switches in the game. For unique Game Test(s), select the "NASC" Icon in the DIAGNOSTICS MENU, reviewed on Pages 27-28.



PULL OUT the Power Interlock Switch for operation with the Coin Door open.



Fire Knocker

To initiate, from the **DIAGNOSTICS MENU**, select the "KNOCKER" *Icon* with either the **Red** "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. The digitally mastered "Knocker" is sounded.

Go To Diagnostics Menu



Sound / Speaker Test

To initiate, from the **DIAGNOSTICS MENU**, select the "SPKR" *Icon* with either the **Red** "LEFT" or **Green** "RIGHT" Buttons and press the Black "ENTER" Button. The BSMT 2000 Sound System produces true digital stereo sound from Backbox & Cabinet Speakers or "Mono" on the Cabinet Speaker (when used by itself). After selecting this *Icon*, select the "-" or "+" *Mini-Icons* and press the **Black** "ENTER" Button to activate the first test. Repeat to visually see & hear all tests. Select the "RUN" Mini-Icon to activate the test chosen without moving to the next test.

Speaker Phase Testing

Note: During Sound Tests, the display shows the speaker identification and the corresponding sound(s). The sound functions allow verification that both channels are functioning properly & that the speaker connections are correct.

Connections to each of speakers are polarized and each must be connected appropriately for the best quality sound. If one speaker has the positive and negative connections reversed with respect to the other one, bass frequencies will not be produced properly and the overall sound quality will be poor. To test for proper speaker phasing, use the sound test to cycle through the Backbox & Cabinet, and Backbox Sine (repeated) functions. If the Cabinet Sine produces more volume and bass than the Left Sine, the speakers are connected properly. If it produces the same or less, one speaker is connected improperly. To isolate and correct reversed speaker connections, one of two methods may be used.

- 1. Check each speaker for polarity markings. If the speakers have polarity markings, verify that the Backbox Speaker **RED-WHT** Wire and the Cabinet Speaker **YEL-WHT** Wire is connected to the negative (-) terminal.
- 2. Disconnect the speaker output connector from the CPU / Sound Board and connect a 1.5-volt battery across each speaker pair one at a time while observing the speakers. Make sure the positive battery terminal is connected to the positive lead (CN4, Pin-3 (RED-BLK) or Pin-6 (YEL-BLK)) each time. As the connection is made, check speaker cone movement; proper connections are indicated by outward movement.

Auto / Manual Tests: Speaker, Sound / OPSYS EPROM (Loc. U7), Voice ROMs 1-4 (U17, U21, U36 & U37). Sounds Produced: Tone, Level 1-3+ Music and/or Speech Pattern 1-3+.

Note: For ROM Usage (Summary Table) & Locations, see Page DR. ● in the "Find-It-In-Front: Dr. Pinball Section". Voice ROMs (U17, U21, U36 and/or U37) which are 8MB must have a Jumper at W6 on the CPÙ/Sound Board to function properly.



Begin Burn In

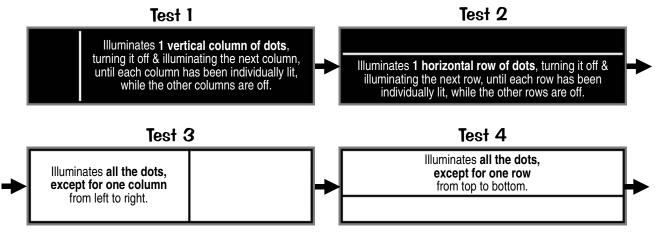
To initiate, from the DIAGNOSTICS MENU, select the "BURN" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. After selecting this Icon the Begin Burn-In Test will start. At this stage the game will exercise all CPU I/O Functions (Dot Matrix Display Test, Coil Testing, Lamp Testing, Sound..., etc.). This is provided to constantly exercise sounds, coils, etc... Cumulative Burn-In minutes will be displayed. Note: To reset Burn-In minutes to 00 see Section 3, Chapter 6, GO TO RESET MENU. Factory Reset. Caution: Performing a Factory Reset will reset all other information as well.



Dot Matrix Test

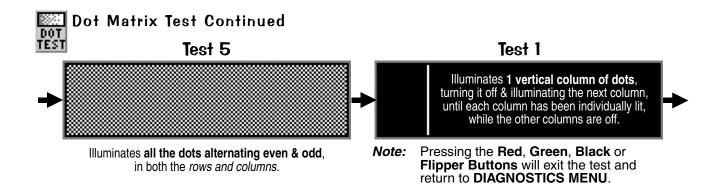
To initiate, from the DIAGNOSTICS MENU, select the "DOT TEST" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. After selecting this *lcon* the Dot Matrix Test immediately begins. *Note:* Pressing any button will exit the test & return to DIAGNOSTICS MENU.

The display will immediately illuminate and cycle for 1 pass of each test continuously for each of the following:



Dot Matrix Test continued on the next page.





Dot Matrix Display Explained

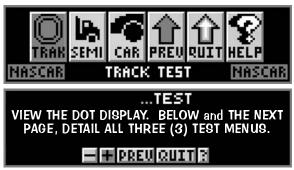
The display utilizes a Micro-Processor Control Board mounted in piggyback fashion to the Dot Matrix Display (128 X 32) Driver Board. The purpose behind this board is to provide more information to the operator as well as displaying graphics to the player.

The board is controlled by a **6809E Microprocessor** and its personality ROM (Unique to the Game). It receives Data, Reset & Clock Information from the CPU/Sound Board via the ribbon cable and sends back multiple Status and Busy Signals to the CPU. This is to insure synchronized communication between the CPU and the Display Controller Board. The Drivers for the rows and columns are provided on 5 surface mounted integrated circuits on the **Dot Matrix Display Driver Board**.



NASCAR® DIAGNOSTICS

To initiate, from the **DIAGNOSTICS MENU**, select the "NASC" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button.



OIN DOOR IS OPEN FIELD HIGH POWER DISABLED BY 1 DOOR INTERLOCK

PULL OUT the Power Interlock Switch for operation with the Coin Door open.

MENU, with the "TRAK" *Icon* flashing. This Sub-Menu is used to test the operation of the OPTOs on the Track ("TRAK" *Icon*), in the Semi-Truck [Spinning Windmill Target] ("SEMI" *Icon*) and the Switches on the Car [Up/Down Mechanism] ("CAR" Icon) . To initiate, from the NASCAR DIAGNOSTICS MENU, select one of the 3 lcons with either the Red or Green Buttons and press the Black Button.

After finishing the Test, select the "PREV" Mini-Icon to return to the Sub-Menu.



Track Diagnostics Test

Selecting the "TRAK" *Icon* will bring up the **TRACK TEST MENU**. Selecting the "+" *Mini-Icon* initiates the **RUNNING** and **OPTO TEST** MENUS. The OPTO Switches to be tested are in the following order *(ball runs on the track counter-clockwise only):* **48**, **47**, **37**, **35** & **34**. The Accelerator Magnet Coils are **Q20**,

This will bring up the

NASCAR TEST

Q25 and Q26, respectively. The track diagnostics consist of a track monitor and two separate tests. The track monitor displays the status of all five optical detectors (OPTOs) used with the track Accelerator Magnets. The three lower OPTOs are displayed on the left side of the screen and the two upper OPTOs are displayed on the right. During normal track operation, the pinball will be moving counterclockwise and the OPTOs will show their closure starting from the top down. The presence of a pinball is indicated by illuminating the small square icon for that particular OPTO for 1/4 second. The icon does not remain illuminated during the entire time an OPTO's light beam is broken, only the transition from opened to closed, however the Switch Test can be used to display the static condition of a track OPTO.

The display will indicate PLUNGE BALL. The first track test is the RUNNING TEST which places the track in its normal running configuration. Plunging a ball will cause the ball to make laps around the track as in normal play. The second track test is the **OPTO TEST**, this test will insure that all OPTOs are functioning properly and are wired in the correct order. Before continuing, ensure the Power Interlock Switch for pulled out as stated above.

RUNNING TEST: Plunge a ball onto the track. If the track is functioning properly, the ball should be able to make laps around the track while the SW. 37, SW. 35, SW. 34, SW. 48 and SW47 icons flash when a ball is seen at that particular OPTO.

Track Test continued on the next page.







NASCAR® Diagnostics Continued

OPTO TEST: (ensure the Power Interlock Switch for pulled out as stated right) Plunge a ball onto the track. If all OPTOs are functioning and are wired in the correct order, the display will read "OPTOS WORKING PROPERLY." If an OPTO is nonfunctional or in the wrong



PULL OUT the Power Interlock Switch for operation with the Coin Door open.

order, the display will read "OPTO MISSING," or "WRONG ORDER," and will also display which OPTO is incorrect. The OPTOs are labeled in order: H0 (SW. 48), H1 (SW. 47), L0 (SW. 37), L1 (SW. 35) and L2 (SW. 34). As the ball leaves the Shooter Lane (groove), HO is the first OPTO and H1 is the second OPTO for the Upper (High) 1-Coil Magnet Accelerator (Q20). L0 is the first OPTO, L1 is the second OPTO and L2 is the third OPTO for the Lower (Low) 2-Coil Magnet Accelerator (Q25 & Q26).

Note: Because a miss-wired OPTO can cause the pinball to stall or not make a complete lap around the track, this test can be performed with the door open and the High Power disabled. PUSH IN the Power Interlock Switch and open the Coin Door for testing without the accelerator magnets. This will prevent the magnets from firing and possibly corrupting the ball's travel.

Truck Diagnostics Test

Selecting the "SEMI" Icon will bring up the TRUCK TEST MENU. Selecting the "+" Mini-Icon initiates the RUNNING, STOPPED, HIDE CAR and SHOW CAR MENUS. The OPTO Switches to be tested are in the following order: 21 & 20. The truck diagnostics consist of an OPTO status monitor and four individual tests. The two OPTOs monitored are the Left Ramp OPTO and the Semi-Truck (Hauler) OPTO (Motor on Backpanel). The Left Ramp OPTO is used to sense the presence of a ball on the Left Ramp, and the Semi OPTO is used to determine the position of the Spinning Car Target at the top of the Left Ramp. The OPTO status monitor will illuminate when an OPTO's beam is blocked and will remain illuminated as long as the OPTO is closed. Before continuing, ensure the Power Interlock Switch for pulled out as stated above.

RUNNING TEST: During the RUNNING TEST the motor will turn on and the Spinning Car Target will rotate. You should see the Truck OPTO in the status monitor turn on and off as the Spinning Car Target rotates.

STOPPED MODE: In the STOPPED MODE, the motor will turn off and Spinning Car Target will stop. The status monitor will reflect the current condition of the optos.

HIDE CAR TEST: In the HIDE CAR TEST, the motor will turn on if the car is visible and the Spinning Car Target will turn until the car is hidden from view. The status monitor will reflect the current condition of the OPTOs, and the Truck OPTO status should be extinguished when the car is hidden.

SHOW CAR TEST: In the SHOW CAR TEST, the motor will turn on if the car is hidden and the Spinning Car Target will turn until the car is in view. The status monitor will reflect the current condition of the OPTOs, and the Truck OPTO status should be illuminated when the car is showing.



Car Diagnostics Test

Selecting the "CAR" *Icon* will bring up the CAR TEST MENU. Selecting the "+" *Mini-Icon* initiates the PLAY TEST, CAR DOWN and CAR UP MENUS. The Switches to be tested are: 36 (STAND-UP TARGETS X2), 40 (TEST CAR), 39 (CAR DOWN) and 52 (Vertical Up-Kicker). *Note:* If the Power Interlock Switch was not pulled out, the display will indicate an error message(s) "Check ..." (e.g. CHECK SWITCH 39 or CHECK COIL Q9). The car diagnostics consist of a switch status monitor and three individual tests. The switch's status icon will illuminate when a switch is closed and remain illuminated as long as the switch is closed. In the PLAY TEST the car will raise when it's struck, lower when the stand-up targets are struck and operate the Vertical Up-Kicker (VUK) when the ball enters the Garage (Up-Down) Scoop. If the car fails to move in the desired direction, the display will show an error message. The PLAY TEST must be performed with the High

PLAY TEST or CAR UP: Important, if the High Power is not activated, you will receive an error message because the car was unable to move. PULL OUT the Power Interlock Switch for operation with the Coin Door Open, and restart the test if you receive the error message. Select either the "+" or "-" Mini-Icon to restart the PLAY TEST. The status monitor will reflect the current condition of the car switches. Dropping a ball in the Garage Scoop will cause the Vertical Up-Kicker to fire the ball out of the Garage Scoop.

Power enabled or the error message will be displayed because the car is unable to move in the desired direction.

CAR DOWN: The status monitor will reflect the current condition of the car switches.



Go To Fuse Table

To initiate, from the **DIAGNOSTICS MENU**, select the "FUSES" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. The **FUSE TABLE MENU** now appears. This provides the technician with the current **Fuse Table** for this game (also noted on a decal in the Backbox). The fuses are located in the Backbox (on the **Display Power Supply Board** and the **I/O Power Driver Board**), and also in the Cabinet (under the playfield by the Flippers and/or by any unique assembly requiring an additional fuse, such as magnets). For the complete **Fuse List** in the Quick Reference Fuse Chart & Pictorials, see the next page or Page **DR**. • (front of this manual).

Example:

After entering **Portals**[™], the **MAIN MENU** now appears with the "DIAG" *Icon* (**GO TO DIAGNOSTICS MENU**) flashing:



Press the **Black** "ENTER" Button to *activate* this **ICON**. The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing; use the **Red** "LEFT" or **Green** "RIGHT" Buttons, until the "FUSES" *Icon* (**GO TO FUSE TABLE**) is flashing:



Press the **Black Button** to *activate* this **ICON**. The **FUSE TABLE** now appears.



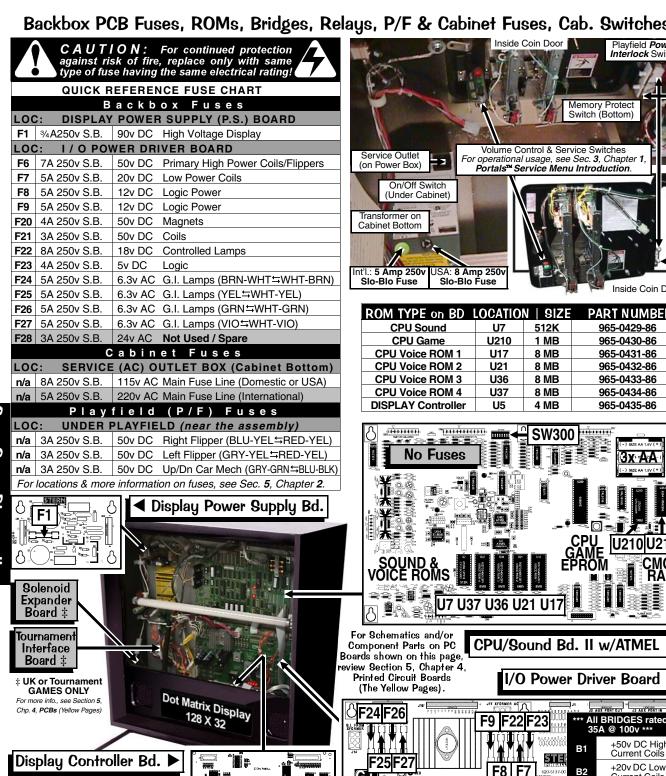
Select and *activate* the "+" *Mini-Icon* to view the next fuse in the group. Continue to select either the "+" or "-" *Mini-Icons* to view each fuse one at a time. The display will describe the fuse identification number (e.g. Main, F1, F6, F7, etc.), rating of fuse (e.g. 5A 250v S.B. - i.e. 5 Amp, 250 volt, Slo-Blo), location of fuse (i.e. Backbox: Board Name located on; or Cabinet: Under the playfield or in Service Outlet), and 'use of fuse' (e.g. 90v DC High Voltage Power, etc.). The current fuse listed will remain in the display until the next fuse is chosen or when the Sub-Menu is exited by selecting & *activating* the "PREV" or "QUIT" *Mini-Icons*.

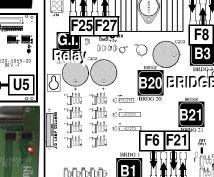
Go To Fuse Table continued on the next page.

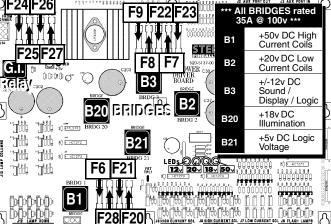




Backbox PCB Fuses, ROMs, Bridges, Relays, P/F & Cabinet Fuses, Cab. Switches







Section 3, Chapter 2 Page 30

The Display Controller has the Display

EPROM (Location: U5 / ROM O).

This board is located behind the

128 X 32 Dot Matrix Display Board.

Dot Matrix Display Bd. (Reverse Side)

No Fuses

DISPLAY EPROM U5 / ROM 0



Playfield **Power**

Interlock Switch

Inside Coin Door

PART NUMBER

965-0429-86

965-0430-86

965-0431-86

965-0432-86

965-0433-86

965-0434-86

965-0435-86

U210 U212 CMO:

512K

1 MB

8 MB

8 MB

8 MB

8 MB

4 MB

SW300

Memory Protect Switch (Bottom)

Dr. Pinball

To initiate, from the **DIAGNOSTICS MENU**, select the Cross "DR." *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. This will bring you (the operator / technician) into **DR. PINBALL** (**Flow Chart Menus**) which offers you a choice of three (3) *Icons*: Coil "DR.", Switch "DR." and Lamp "DR." *Icons*. Selecting a particular *Icon* will give you a choice of which specific Coil (any and all coil assemblies such as Flippers, VUKs, Magnets, etc.), Switch or Lamp circuit needs to be diagnosed. *Dr. Pinball* will now display a question or give a procedure to follow such as "Does the lamp turn on?" or "Check bridge rectifier BR-20, if short replace." When *Dr. Pinball* displays a question or requests a procedure, *Dr. Pinball* will expect a response such as "NO" or "YES" (see below examples of the Mini-Icons which will prompt the operator). You the operator/technician must respond by using the **Red** or **Green Buttons** to "SELECT" a Mini-Icon and the **Black Button** to "ACTIVATE or ENTER" your selection.



Coil Flow Chart

To initiate, from the **DR. PINBALL MENU**, select the Coil "DR." *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. This is the **Coil Flow Chart**. Follow the questions, answering by using the *Mini-Icons* in the display.



Switch Flow Chart

To initiate, from the **DR. PINBALL MENU**, select the Switch "DR." *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. This is the **Switch Flow Chart**. Follow the questions, answering by using the *Mini-Icons* in the display.



Lamp Flow Chart

To initiate, from the **DR. PINBALL MENU**, select the Lamp "DR." *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. This is the **Lamp Flow Chart**. Follow the questions, answering by using the *Mini-Icons* in the display.

The following are the Mini-Icons with explanations for the DR. PINBALL Sub-Menus:



Select and *activate* either the "-" or "+" *Mini-Icons* to diagnose a Coil, Lamp or Switch. Select and *activate* the "RUN" *Mini-Icon* to test selected item. The "PREV" *Mini-Icon* allows you to go back to previous question. Select the "QUIT" *Mini-Icon* to exit **Portals**[™] completely. Select the "?" *Mini-Icon* (Help) to see directions on button usage.

NO YES END PREU QUIT ?

Select and activate either the "NO or "YES" Mini-Icons to answer a question given. Select and activate the "END" Mini-Icon to change to a new item to test. The "PREV" Mini-Icon allows you to go back to previous question. Select the "QUIT" Mini-Icon to exit Portals™ completely. Select the "?" Mini-Icon (Help) to see directions on button usage.

END PREU QUIT ?

After a diagnosis is given, select and *activate* the "END" *Mini-Icon* to change to a new item to test. The "PREV" *Mini-Icon* allows you to go back to previous display. Select the "QUIT" *Mini-Icon* to exit **Portals™** completely. Select the "?" *Mini-Icon* (Help) to see directions on button usage.

PULSE NO YES END PREU QUIT ?

In **COIL FLOW CHART MENU**, select and *activate* the "PULSE" *Mini-Icon* to pulse the coil selected. Select and *activate* the "END" *Mini-Icon* to change to a new item to test. The "PREV" *Mini-Icon* allows you to go back to previous question. Select the "QUIT" *Mini-Icon* to exit **Portals**[™] completely. Select the "?" *Mini-Icon* (Help) to see directions on button usage.





G		TARTING METER Date (MM/DD/YR) : AUDITOR'S UDIT Date (MM/DD/YR) : CPU Version		CURRENT VOLUME SETTING: GAME LOCATION NAME:
ਹ੍ ਰੰ	AG AUD ADJ INST RESET TO	MAIN AUD ERRNINGS RUG	EARNI 01-14 Audit definition	NGS AUDITS
Field Andit Tracking Performance	FREE GAME PERCENTAGE AVERAGE BALL TIME AVERAGE GAME TIME COINS THRU	06 COINS THRU RIGHT SLOT 07 COINS THRU CENTER SLOT 08 COINS THRU 4TH SLOT 09 COINS THRU 5TH SLOT 10 6TH SLOT	11 TOTAL COINS 12 TOTAL EARNINGS 13 METER CLICKS 14 SOFTWARE METER	
ME	AG AUD ADJ INST RESET TO AIN GO TO RUDITS MENU	MAIN AUD STRNORRO HUD	O1-68 Audit definition	ARD AUDITS B =
01 02 03 04	TOTAL EXTRA BALLS EXTRA BALL PERCENT BEDLAY 1	25 SCORES 26 25M-34.9M SCORES 27 35M-49.9M SCORES 28 50M-74.9M SCORES	50 BASE REPLAY 51 LEFT FLIPF USED 52 RIGHT FLIP USED	PER
05 06 07 08 08 08 08 08 08 08 08 08 08 08 08 08	TOTAL REPLAYS REPLAY PERCENT TOTAL	29 SCORES 30 100M-149.9M SCORES 31 150M+ SCORES 32 AVERAGE SCORES	53 PROPRIETA 54 PROPRIETA 55 0-1 MINUTI GAMES 56 1-1.5 MINUTI GAMES	ARY
10 11	SPECIAL PERCENT TOTAL MATCHES HIGH SCORE AWARDS	33 SERVICE CREDITS 34 BALL SEARCH STARTED 35 LOST BALL FEEDS	50 GAMES 57 1.5 - 2 MINI GAMES 58 2 - 2.5 MINI GAMES 59 2.5 - 3 MINI GAMES	UTE
13 13 14	PERCENT TOTAL FREE PLAYS TOTAL PLAYS . 0-1.9M SCORES	36 GAME STARTS 37 LEFT DRAINS 38 CENTER DRAINS 39 RIGHT DRAINS	60 GAMES 61 3.5 - 4 MINI GAMES 62 4 - 5 MINUT GAMES 63 5 - 6 MINUT GAMES	UTE re
16 17 18 19	3 SCORES 54 4M-5.9M SCORES 6M-7.9M SCORES 8M-9.9M	40 TILTS 41 TOTAL BALLS SAVED 42 PROPRIETARY 43 PROPRIETARY	64 6-8 MINUT GAMES 65 8-10 MINU GAMES 66 10-15 MIN GAMES 67 15+ MINUTI GAMES	UTE
20	12 FM 14 OM	44 PROPRIETARY 45 PROPRIETARY	68 RECENT REPLAY PE Note: Audits are subj	ERCENT ect to change (with or without notice).

PROPRIETARY

PROPRIETARY

PROPRIETARY

46

47

15M-17.4M SCORES

17.5M-19.9M SCORES

20M-22.4M SCORES

22

23

24



Go To Audits Menu

Overview

The Portals™ Service Menu System provides 114 Audits for accounting purposes and for evaluation of Game Programming. The Audits are divided into 3 groups: • Earnings Audits (Audits 01-14), • Standard Audits (Audits 01-68) and • Feature Audits (Programming Use Only) (Audits 01-32). For details on Tournament Audits, see Section 3, Chapter 7, GO TO TOURNAMENT MENU. Audits which are named Proprietary are also for *Future Expansion* or *Programming*. Game code may get upgraded during production; compare all Audits in the display with the manual and make any corrections to the Audit Table *(previous page)*, as necessary. Audits are subject to change (with or without notice). To view Audits in the display, enter the Portals Service Menu System. For how to RESET Audits, see Section 3, Chapter 6, GO TO RESET MENU.

______ EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

Select and activate to:











Move LEFT or RIGHT, select previous / next or move backwards / forwards.

These non-selectable /cons appear in the selected Menu only when there are MORE Icons to the LEFT or to the RIGHT

 (\mathbf{m})

PREVIOUS Menu.

to QUIT, exits & returns to the Attract Mode.

Select and activate Select and activate Select and activate Screens of the current Menu*.

* Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.

GO TO AUDITS MENU

After entering **Portals**[™], the **MAIN MENU** now appears. Select the "AUD" *lcon* in the **MAIN MENU** with either the **Red** "**LEFT**" or **Green** "**RIGHT**" **Buttons** (the **Flipper Buttons** operates in the same manner) and press the Black "ENTER" Button (the Start Button operates in the same manner). The AUDITS

MENU appears. Continue through this chapter for the explanation & usage of the *Icons* in the AUDITS MENU.

Earnings Audits (01-14)

To initiate, from the AUDITS MENU, select the "EARN" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Select and activate either of the ">>" Mini-Icons to view the next or previous Audit in this group. The display will describe the Audit Number, Audit Name and the Current Audit Total (Value). The current Audit will remain in the display until the next Audit is viewed or when this Menu is exited.

Nr. **EARNINGS AUDIT NAME: Definition**

- 01 **TOTAL PAID CREDITS:** Provides the total number of *Paid Credits*.
- FREE GAME PERCENTAGE: Provides the percentage total by dividing Standard Audit 13, TOTAL FREE 02 **PLAYS**, by Standard Audit 14, TOTAL PLAYS.
- AVERAGE BALL TIME: In seconds, the average ball time is derived from the total play time divided by 03 Standard Audit 01, TOTAL BALLS PLAYED
- 04 **AVERAGE GAME TIME:** The average game time is expressed in minutes and seconds (0:00).
- 05 COINS THRU LEFT SLOT: Provides the total number of times Coin Mechanism Switch 06 was closed.
- COINS THRU RIGHT SLOT: Provides the total number of times Coin Mechanism Switch 04 was closed. 06
- 07 COINS THRU CENTER SLOT: Provides the total number of times Coin Mechanism Switch 05 was closed.
- 80 COINS THRU 4TH SLOT: Provides the total number of times Coin Mechanism Switch 02 was closed.
- COINS THRU 5TH SLOT: Provides the total number of times Coin Mechanism Switch 07 was closed. 09
- 10 COINS THRU 6TH SLOT: Provides the total number of times Coin Mechanism Switch 03 was closed.
- 11 TOTAL COINS: Provides the total amount of coins registered through all the Coin Slots.
- **TOTAL EARNINGS:** The total cash value accumulated since the last Factory Reset occurred. 12 See Section 3, Chapter 6, GO TO RESET MENU, Reset Coin Audits.
- METER CLICKS: Provides the total number of money clicks accumulated. Based on the country's lowest 13 coin denomination used for the game credit.
- **SOFTWARE METER:** Provides the continuing total of Meter Clicks. This audit cannot be reset; the display 14 shows the constant addition of Meter Clicks.



Standard Audits (01-68) 111

To initiate, from the AUDITS MENU, select the "S.P.I." *Icon* with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Audit in this group. The display will describe the Audit Number, Audit Name and the Current Audit Total (Value). The current Audit will remain in the display until the next Audit is viewed or when this Menu is exited.

	OTANDADD AUDIT MARKE D D 111
Nr.	STANDARD AUDIT NAME: Definition
01 02	TOTAL BALLS PLAYED: Provides the total number of <i>Regular</i> and <i>Extra Balls</i> . TOTAL EXTRA BALLS: Provides the total number of <i>Extra Balls</i> awarded.
03	EXTRA BALLS PERCENT: Provides the percentage total by dividing Standard Audit 02, TOTAL EXTRA
04	BALLS, by Standard Audit 14, TOTAL PLAYS. PERLAY 1 AWARDS: Provides the total Awards (Credits, Extra Balls or Secres) for Level 1
04 05	REPLAY 1 AWARDS: Provides the total Awards (Credits, Extra Balls or Scores) for Level 1. REPLAY 2+ AWARDS: Provides the total Awards (Credits, Extra Balls or Scores) for Level 2 or higher.
06	TOTAL REPLAYS: Provides the total Awards (Credits, Extra Balls or Scores) for exceeding Replay Score
07	Levels. REPLAY PERCENT: Provides the percentage total from dividing Standard Audit 06, TOTAL REPLAYS, by Standard Audit 14, TOTAL PLAYS. The percentage reflects replay total awards for exceeding replay score levels.
08	TOTAL SPECIALS: Provides the total Awards (Credits, Extra Balls, or Scores) for making Specials.
09	SPECIAL PERCENT: Provides the percentage total by dividing Standard Audit 08, TOTAL SPECIALS, by Standard Audit 14, TOTAL PLAYS.
10	TOTAL MATCHES: Provides the total <i>Credits</i> awarded for matching the last two digits of the score with the <i>System-Generated Match Number</i> at the end of the game. Percentage of <i>Match Credits</i> is adjustable from 0% to 10% by Standard Adjustment 13 , MATCH PERCENTAGE , if enabled. <i>See Section 3, Chapter 4, GO TO ADJUSTMENTS MENU, Standard Adjustments</i> .
11	HIGH SCORE AWARDS: Provides the total <i>Awards (Credits, Extra Balls, or Scores)</i> for exceeding the High-Score-To-Date scores.
12	HIGH SCORE PERCENT: Provides the percentage total by dividing Standard Audit 11, HIGH SCORE AWARDS, by Standard Audit 14, TOTAL PLAYS.
13	TOTAL FREE PLAYS: Provides the total <i>Free Credits</i> for <i>Replays, High-Score-To-Date, Specials and Match.</i>
14	TOTAL PLAYS: This total is derived by adding the sum of Earnings Audit 01 , TOTAL PAID CREDITS , and Standard Audit 13 , TOTAL FREE PLAYS . Note: Free Credits are not recorded in the Audit until they are actually used.
15	0–1.9M SCORES: Provides the total number of games the Player's final score was 0 and 1,999,990 points.
16	2M-3.9M SCORES: and the Player's final score was between 2,000,000 and 3,999,990 points.
17	4M-5.9M SCORES: and the Player's final score was between 4,000,000 and 5,999,990 points.
18	6M-7.9M SCORES: and the Player's final score was between 6,000,000 and 7,999,990 points.
19	8M-9.9M SCORES: and the Player's final score was between 8,000,000 and 9,999,990 points.
20	10M-12.4M SCORES: and the Player's final score was between 10,000,000 and 12,499,990 points.
21	12.5M-14.9M SCORES: and the Player's final score was between 12,500,000 and 14,499,990 points.
22	15M-17.4M SCORES: and the Player's final score was between 15,000,000 and 17,499,990 points.
23	17.5M-19.9M SCORES: and the Player's final score was between 17,500,000 and 19,999,990 points.
24	20M-22.4M SCORES: and the Player's final score was between 20,000,000 and 22,499,990 points.
25	22.5M-24.9M SCORES: and the Player's final score was between 22,500,000 and 24,999,990 points.
26	25M-34.9M SCORES: and the Player's final score was between 25,000,000 and 34,999,990 points.
27 28	35M-49.9M SCORES: and the Player's final score was between 35,000,000 and 49,999,990 points. 50M-74.9M SCORES: and the Player's final score was between 50,000,000 and 74,999,990 points.
29	75M–99.9M SCORES: and the Player's final score was between 75,000,000 and 99,999,990 points.
30	100M-149.9M SCORES: and the Player's final score was between 100,000,000 and 149,999,990 points.
31	150M+ SCORES: Provides the total number of games the Player's final score was 150,000,000 points and over.
32	AVERAGE SCORES: This total is derived from adding the <i>Final Score</i> of each game to a table and dividing this sum by Standard Audit 14. TOTAL PLAYS

Standard Audits 33-68 continued on the next page.

this sum by Standard Audit 14, TOTAL PLAYS.





Standard Audits Continued. 44 FF

STANDARD AUDIT NAME: Definition

- SERVICE CREDITS: Provides the total number of times the Portals™ Green Button (Dedicated Switch 7) was pushed in Attract Mode.
- See Section 3, Chapter 1, Service Switch Set Access & Use, for how to receive Service Credits.
 See Sec. 3, Chp. 6, GO TO RESET MENU, Reset Credits, for how to delete Service (and Paid Credits).
- 34 BALL SEARCH STARTED: Provides the total number of times the game performed a Ball Search.
- LOST BALL FEEDS: Provides the total number of times the game added a pinball to play when it could not find a pinball after *Ball Search*.
 - See Section 3, Chapter 2, GO TO DIAGNOSTICS MENU, Technicians Alert [Pinball Detection].
- LOST BALL GAME STARTS: Provides the total number of times the game started with a pinball missing from the ball trough at the start of a game.
- See Section 3, Chapter 2, GO TO DIAGNOSTICS MENU, Technicians Alert [Pinball Detection].
- 37 LEFT DRAINS: Provides the total number of times Rollover Switch 57 was closed.
- **CENTER DRAINS:** Provides the total number of times the pinball had drained when the last switch closed was not Switch 57 or Switch 60.
- 39 RIGHT DRAINS: Provides the total number of times Rollover Switch 60 was closed.
- 40 TILTS: Provides the total number of times Contact Switch 56 was closed.
- TOTAL BALLS SAVED: Provides the total number of times this feature was used (this feature can be turned ON or OFF, see Standard Adj. 38, FREEZE TIME in Section 3, Chapter 4, GO TO ADJUSTMENTS MENU, Standard Adjustments). This feature is enabled at the start of each pinball and is disabled as soon as a predetermined number of switches are "closed" or the allocated time has expired.
- >> 42 49 PROPRIETARY: Proprietary Audits are used for Future Expansion or Programming.
- 50 BASE REPLAY: Provides the current base Replay Level Score.
- **LEFT FLIPPER USED:** Provides the total number of times the **Left Flipper Button** (Dedicated Switch 1) was pushed in **Game Mode**.
- **RIGHT FLIPPER USED:** Provides the total number of times the **Right Flipper Button** (Dedicated Switch 3) was pushed in **Game Mode**.
- >> 53 54 PROPRIETARY: Proprietary Audits are used for Future Expansion or Programming.
- 55 0 1 MINUTE GAMES: Provides the total number of games the total game time was between 0:00 and 1:00 minute.
- 1 1.5 MINUTE GAMES: Provides the total number of games the total game time was between 1:00 and 1:30 minutes.
- 57 1.5 2 MINUTE GAMES: Provides the total number of games the total game time was between 1:30 and 2:00 minutes.
- 58 2 2.5 MINUTE GAMES: Provides the total number of games the total game time was between 2:00 and 2:30 minutes.
- 2.5 3 MINUTE GAMES: Provides the total number of games the total game time was between 2:30 and 3:00 minutes.
- **3 3.5 MINUTE GAMES:** Provides the total number of games the total game time was between **3:00** and **3:30** minutes.
- 3.5 4 MINUTE GAMES: Provides the total number of games the total game time was between 3:30 and 4:00 minutes.
- 4 5 MINUTE GAMES: Provides the total number of games the total game time was between 4:00 and 5:00 minutes.
- 5 6 MINUTE GAMES: Provides the total number of games the total game time was between 5:00 and 6:00 minutes.
- 6-8 MINUTE GAMES: Provides the total number of games the total game time was between 6:00 and 8:00 minutes.
- 8 10 MINUTE GAMES: Provides the total number of games the total game time was between 8:00 and 10:00 minutes.
- 66 10 15 MINUTE GAMES: Provides the total number of games the total game time was between 10:00 and 15:00 minutes.
- 15+ MINUTE GAMES: Provides the total number of games the total game time was 15:00 and over.
- **RECENT REPLAY PERCENT:** Percent figured with programming thresholds for a determined number of games (again based on programming thresholds). The percentage reflects replay total awards for exceeding replay score levels.



Feature Audits (01-<mark>32</mark>)



To initiate, from the **AUDITS MENU**, select the "NASC" *lcon* with either the **Red** "**LEFT**" or **Green** "**RIGHT**" **Buttons** and press the **Black** "**ENTER**" **Button**. Select and *activate* either of the ">>" *Minilons* to view the next or previous Audit in this group. The display will describe the **Audit Number**, **Audit Name** and the **Current Audit Total** (Value). The current Audit will remain in the display until the next Audit is viewed or when this Menu is exited. **Audits Definition: Programming Use Only.** The proprietary information provides the total number of times a feature was started, awarded, lit, played and/or completed (awarded); also, the total number of Switch Closures during certain modes or features are tracked (a predetermined single/multiple variations of switch closures are used to determine the lighting and/or completion of the feature stated).

FEATURE AUDIT TABLE





FEATURE AUDITS

01-32 🖾 = 🕲 💶 🕩

*** PROGRAMMING USE ONLY ***
ILABELED BOXES ARE FOR FUTURE EXPANSION.

				UNLA	ABELI	ED BOXES ARE FOR FUTURE EXPANSION.
01	LOCKS LIT	01	LOCKS LIT		01	LOCKS LIT
02	1 BALL LOCKED	02	1 BALL LOCKED		02	1 BALL LOCKED
03	2 BALLS LOCKED	03	2 BALLS LOCKED		03	2 BALLS LOCKED
04	MULTIBALL STARTS	04	MULTIBALL STARTS		04	MULTIBALL STARTS
05	JACKPOTS	05	JACKPOTS		05	JACKPOTS
06	SUPER JACKPOTS	06	SUPER JACKPOTS		06	SUPER JACKPOTS
07	TEST CAR HIT	07	TEST CAR HIT		07	TEST CAR HIT
80	CAR SCOOPS	08	CAR SCOOPS		80	CAR SCOOPS
09	GARAGE AWARDS	09	GARAGE AWARDS		09	GARAGE AWARDS
10	SCANNER AWARDS	10	SCANNER AWARDS		10	SCANNER AWARDS
11	LEFT RAMPS	11	LEFT RAMPS		11	LEFT RAMPS
12	TRUCK AWARDS	12	TRUCK AWARDS		12	TRUCK AWARDS
13	RIGHT RAMPS	13	RIGHT RAMPS		13	RIGHT RAMPS
14	CHAMP1 LETTERS	14	CHAMP1 LETTERS		14	CHAMP1 LETTERS
15	FLAG STANDUPS	15	FLAG STANDUPS		15	FLAG STANDUPS
16	SHORT TRACK LAPS	16	SHORT TRACK LAPS		16	SHORT TRACK LAPS
17	SPINNING CAR HITS	17	SPINNING CAR HITS		17	SPINNING CAR HITS
18	TRACK PASSES LOW	18	TRACK PASSES LOW		18	TRACK PASSES LOW
19	TRACK PASSES HIGH	19	TRACK PASSES HIGH		19	TRACK PASSES HIGH
20	BONUS X COLLECTED	20	BONUS X COLLECTED		20	BONUS X COLLECTED
21	GARAGE COMPLETED	21	GARAGE COMPLETED		21	GARAGE COMPLETED
22	CHAMP1 COMPLETED	22	CHAMP1 COMPLETED		22	CHAMP1 COMPLETED
23	PROPRIETARY 01	23	PROPRIETARY 01		23	PROPRIETARY 01
24	PROPRIETARY 02	24	PROPRIETARY 02		24	PROPRIETARY 02
25	PROPRIETARY 03	25	PROPRIETARY 03		25	PROPRIETARY 03
26	PROPRIETARY 04	26	PROPRIETARY 04		26	PROPRIETARY 04
27	PROPRIETARY 05	27	PROPRIETARY 05		27	PROPRIETARY 05
28	PROPRIETARY 06	28	PROPRIETARY 06		28	PROPRIETARY 06
29	PROPRIETARY 07	29	PROPRIETARY 07		29	PROPRIETARY 07
30	PROPRIETARY 08	30	PROPRIETARY 08	7	30	PROPRIETARY 08
31	PROPRIETARY 09	31	PROPRIETARY 09		31	PROPRIETARY 09
32	PROPRIETARY 10	32	PROPRIETARY 10		32	PROPRIETARY 10
			I			

Note: Audits are subject to change (with or without notice).



Go To Printer Menu (OPTIONAL USE ONLY)

Operational Usage Note: The use of the following Sub-Menus are OPTIONAL and provided as a convenience only. No special equipment was included with your Pinball Game. To initiate, from the AUDITS MENU, select the "PRNT" Icon with either the Red "LÉFT" or Green "RIGHT" Button and press the Black "ENTER" Button. The PRINTER MENU appears. A Quick / Full Printout Kit* and RS-232 Communication Device** (which can download serial information) are required for proper operation of these Sub-Menus. Entering the menus & selecting/activating the Icons without the equipment mentioned, will not affect the Pinball Game nor the operation of the Portals™ Service Menu System in any way. For more details on the equipment & hardware required, installation and set-up, read the Quick/Full Printout Set-Up Instruction Manual (SPI Part Number: 780-6012-00) provided in the Quick/Full Printout Kit (SPI Part Number: 502-5031-00).

*Not included with this ToPS™ Ready Pinball Game. **Not included in the Quick/Full Printout Kit.







Quick Printout

To initiate, from the **PRINTER MENU**, select the "QUIK" *Icon* with either the **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Mini-Icon* and press the **Black Button** to start the printout. Per the display instruction, the **Stort Button** and press the **Black Button** to start the printout. Per the display instruction, the **Start Button** can also be pressed to start the printout. Only the Earnings Audits can be retrieved and/or printed for further processing.

Full Printout

To initiate, from the **PRINTER MENU**, select the "ALISON" *Icon* with either the **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Mini-Icon* and press the **Black Button** to start the download. Per the display instruction, the **Start Button** can also be pressed to start the download. All Earnings, Standard, Feature & Tournament Audits can be retrieved and/or printed for further processing.

Reset Printer

To initiate, from the **PRINTER MENU**, select the "RESET" *lcon* with either the **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Mini-Icon* and press the **Black Button** to clear the "Nº of copies printed" count total appearing in the display. *Operational Usage Note:* Activating the "QUIK" Icon (in the previous Quick Printout) **without** the special equipment and unique software, will still provide a "count total" in this Reset Printer Menu, which does not affect the operation of the Portals™ Service Menu System in any way. Activating this "RESET" Icon will reset the "count total" in the display to 00.

For how to RESET Audits, see Section 3, Chapter 6, GO TO RESET MENU.







EARNINGS AUDITS 01-04 ONLY, STANDARD AUDITS 01-68 & ALL FEATURE AUDITS



	ING METER Reading:		STARTING METE		MM/DD/YR): AUDITOR' CPU Versi		PLAY Vers		IRRENT VOLUME SETTING: AME LOCATION NAME:			
	EARNINGS & STANDARD AUDIT TABLES											
£	7 &	圇	総合	\$			l		S AUDITS 🖄 = 🕲 ┫ 🕪			
ĎIA(MAII	ACCORDING TO SHARP SHAPE THE PARTY OF THE PA	ASSESSMENT AND ADDRESS OF THE PERSON NAMED IN	AND DESCRIPTION OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED I	EARH	S.P. I. NASC PRHT P	STATE OF THE PERSON NAMED IN COLUMN 2 IS NOT THE OWNER.						
							Audit	detinitions to	llow in this Chapter.			
01	TOTAL PAID CREDITS			06	COINS THRU RIGHT SLOT		11	TOTAL COINS				
02	FREE GAME PERCENTAGE			07	COINS THRU CENTER SLOT		12	TOTAL EARNINGS				
03	AVERAGE BALL TIME			08	COINS THRU 4TH SLOT		13	METER CLICKS				
04	AVERAGE GAME TIME			09	COINS THRU 5TH SLOT		14	SOFTWARE METER				
05	COINS THRU LEFT SLOT			10	COINS THRU 6TH SLOT							
Q	G AUD ADJ INST		왕 한 한 한 한 한 한	(S) EARI	S.P.I. NASC PRHT	TO TO P	9		D AUDITS = 🖎 🚹 🙌			
Mall	CO TO RUDITS	MEN	MAIN	AUD	STANDARD AL		Audit_	definitions fo	llow in this Chapter.			
01	TOTAL			25	22.5M-24.9M	1	49	PROPRIETARY	ent Audits, see Pages 36 or 54.			
02	BALLS PLAYED TOTAL			26	SCORES 25M-34.9M		50	BASE				
03	EXTRA BALLS EXTRA BALL			27	SCORES 35M-49.9M		51	REPLAY LEFT FLIPPER				
04	PERCENT REPLAY 1			28	SCORES 50M-74.9M		52	USED RIGHT FLIPPER				
	AWARDS REPLAY 2+			-	SCORES 75M-99.9M			USED PROPRIETARY				
05	AWARDS TOTAL			29	SCORES 100M-149.9M		53					
06	REPLAYS REPLAY			30	SCORES 150M+		54	PROPRIETARY 0–1 MINUTE				
07	PERCENT TOTAL			31	SCORES AVERAGE		55	GAMES 1 – 1.5 MINUTE				
80	SPECIALS SPECIAL			32	SCORES SERVICE		56	GAMES 1.5 – 2 MINUTE				
09	PERCENT TOTAL			33	CREDITS BALL SEARCH		57	GAMES 2 – 2.5 MINUTE				
10	MATCHES HIGH SCORE			34	STARTED		58	GAMES				
11	AWARDS			35	LOST BALL		59	2.5 – 3 MINUTE GAMES				
12	HIGH SCORE PERCENT			36	LOST BALL GAME STARTS		60	3 – 3.5 MINUTE GAMES				
13	TOTAL FREE PLAYS			37	LEFT DRAINS		61	3.5 – 4 MINUTE GAMES				
14	TOTAL PLAYS			38	CENTER DRAINS		62	4 – 5 MINUTE GAMES				
15	0-1.9M SCORES			39	RIGHT DRAINS		63	5 – 6 MINUTE GAMES				
16	2M-3.9M SCORES			40	TILTS		64	6 – 8 MINUTE GAMES				
17	4M-5.9M SCORES			41	TOTAL BALLS SAVED		65	8 – 10 MINUTE GAMES				
18	6M-7.9M SCORES			42	PROPRIETARY		66	10 – 15 MINUTE GAMES				
19	8M-9.9M SCORES			43	PROPRIETARY		67	15+ MINUTE GAMES				
20	10M-12.4M SCORES			44	PROPRIETARY		68	RECENT REPLAY PERCE	NT			
21	12.5M-14.9M SCORES			45	PROPRIETARY		Note: /		change (with or without notice).			
22	15M-17.4M SCORES			46	PROPRIETARY							
23	17.5M-19.9M SCORES			47	PROPRIETARY		†					
24	20M-22.4M SCORES			48	PROPRIETARY		1					



FEATURE AUDIT TABLE





FEATURE AUDITS 01-32 Ø = 14 FF

*** PROGRAMMING USE ONLY ***

				UNL	NLABELED BOXES ARE FOR FUTURE EXPANSION.			
01	LOCKS LIT	01	LOCKS LIT		01	LOCKS LIT		
02	1 BALL LOCKED	02	1 BALL LOCKED		02	1 BALL LOCKED		
03	2 BALLS LOCKED	03	2 BALLS LOCKED		03	2 BALLS LOCKED		
04	MULTIBALL STARTS	04	MULTIBALL STARTS		04	MULTIBALL STARTS		
05	JACKPOTS	05	JACKPOTS		05	JACKPOTS		
06	SUPER JACKPOTS	06	SUPER JACKPOTS		06	SUPER JACKPOTS		
07	TEST CAR HIT	07	TEST CAR HIT		07	TEST CAR HIT		
08	CAR SCOOPS	08	CAR SCOOPS		80	CAR SCOOPS		
09	GARAGE AWARDS	09	GARAGE AWARDS		09	GARAGE AWARDS		
10	SCANNER AWARDS	10	SCANNER AWARDS		10	SCANNER AWARDS		
11	LEFT RAMPS	11	LEFT RAMPS		11	LEFT RAMPS		
12	TRUCK AWARDS	12	TRUCK AWARDS		12	TRUCK AWARDS		
13	RIGHT RAMPS	13	RIGHT RAMPS		13	RIGHT RAMPS		
14	CHAMP1 LETTERS	14	CHAMP1 LETTERS		14	CHAMP1 LETTERS		
15	FLAG STANDUPS	15	FLAG STANDUPS		15	FLAG STANDUPS		
16	SHORT TRACK LAPS	16	SHORT TRACK LAPS		16	SHORT TRACK LAPS		
17	SPINNING CAR HITS	17	SPINNING CAR HITS		17	SPINNING CAR HITS		
18	TRACK PASSES LOW	18	TRACK PASSES LOW		18	TRACK PASSES LOW		
19	TRACK PASSES HIGH	19	TRACK PASSES HIGH		19	TRACK PASSES HIGH		
20	BONUS X COLLECTED	20	BONUS X COLLECTED		20	BONUS X COLLECTED		
21	GARAGE COMPLETED	21	GARAGE COMPLETED		21	GARAGE COMPLETED		
22	CHAMP1 COMPLETED	22	CHAMP1 COMPLETED		22	CHAMP1 COMPLETED		
23	PROPRIETARY 01	23	PROPRIETARY 01		23	PROPRIETARY 01		
24	PROPRIETARY 02	24	PROPRIETARY 02		24	PROPRIETARY 02		
25	PROPRIETARY 03	25	PROPRIETARY 03		25	PROPRIETARY 03		
26	PROPRIETARY 04	26	PROPRIETARY 04		26	PROPRIETARY 04		
27	PROPRIETARY 05	27	PROPRIETARY 05		27	PROPRIETARY 05		
28	PROPRIETARY 06	28	PROPRIETARY 06		28	PROPRIETARY 06		
29	PROPRIETARY 07	29	PROPRIETARY 07		29	PROPRIETARY 07		
30	PROPRIETARY 08	30	PROPRIETARY 08		30	PROPRIETARY 08		
31	PROPRIETARY 09	31	PROPRIETARY 09		31	PROPRIETARY 09		
32	PROPRIETARY 10	32	PROPRIETARY 10		32	PROPRIETARY 10		
	·			1		L		

 $\textbf{\textit{Note:}} \ \textit{Audits are subject to change (with or without notice)}.$



MULTI-WEEK TOURNAMENT AUDIT TABLES

		Date (MM/DD/YR) :	AUDITOR'S NAME :			CURRENT VOLUME SETTING:
CURRENT METER Reading :	AUDIT Date (MM/DD/	(YR):	CPU Version :	DISPL	AY Version :	GAME LOCATION NAME :
01 TOTAL PLAYS 02 TOURNAMENT PLAYS 03 TOTAL QUALIFYING PLAYS 04 GAME EARNINGS 05 TOTAL		06 JACKPOT 07 NET EARNINGS 08 ACCUM. TO PLAYS 09 ACCUM. TOUR. PLAY 10 ACCUM. QUALIFYIN	YS		ACCUM. 12 ACCUM. TOUR EARN 13 ACCUM. JACKPOT 14 #TOURNAM	
CURRENT METER Reading: O1 TOTAL PLAYS O2 TOURNAMENT PLAYS O3 QUALIFYING PLAYS TOTAL GAME EARNINGS O5 TOTAL TOUR. EARNINGS		0	YS	DISPL	AY Version : 11 ACCUM. EARNINGS 12 ACCUM. TOUR EARN 13 ACCUM. JACKPOT 14 # TOURNAM	
STADTING METER Pooding .						
CURRENT METER Reading: O1 TOTAL PLAYS O2 TOURNAMENT PLAYS O3 TOTAL QUALIFYING PLAYS O4 GAME EARNINGS TOTAL TOTAL GAME EARNINGS TOTAL TOTAL GAME EARNINGS		0	YS	DISPL	AY Version : ACCUM. EARNINGS 12 ACCUM. TOUR EARN 13 ACCUM. JACKPOT 14 # TOURNAM	





STANDARD & FEATURE **ADJUSTMENT TABLES**

STANDARD ADJUSTMENTS 01-55 🛍 = 🦠





Nr.	ADJUSTMENT NAME	USA Default	YOUR SETTING
01	REPLAY TYPE	AUTO	,
02*	REPLAY PERCENTAGE	10%	
03	REPLAY AWARD	CREDIT	
04*	REPLAY LEVELS	1: 20,000,000	
05	REPLAY BOOST	YES	
06	SPECIAL AWARD	CREDIT	
07*	SPECIAL PERCENTAGE	0%	
08	FREE GAME LIMIT	05	
09*	EXTRA BALL LIMIT	09	
10*	EXTRA BALL PERCENTAGE	25%	
11	GAME PRICING	USA 5	
12	MATCH AWARD	CREDIT	
13*	MATCH PERCENTAGE	9%	
14	BALLS PER GAME	03	
15	TILT WARNINGS	01	
16	CREDIT LIMIT	30	
17	ALLOW HIGH SCORES	YES	
18	GRAND CHAMPION AWARDS	01	
19	HIGH SCORE #1 AWARDS	01	
20	HIGH SCORE #2 AWARDS	00	
21	HIGH SCORE #3 AWARDS	00	
22	HIGH SCORE #4 AWARDS	00	
23*	GRAND CHAMPION SCORE	100,000,000	
24*	DEFAULT HIGH SCORE #1	65,000,000	
25*	DEFAULT HIGH SCORE #2	55,000,000	
26*	DEFAULT HIGH SCORE #3	50,000,000	
27*	DEFAULT HIGH SCORE #4	45,000,000	
28	HSTD RESET COUNT	2,000	
	· · · · · · · · · · · · · · · · · · ·	·	-

Nr.	ADJUSTMENT NAME	USA YOUR Default setting
29	HIGH SCORE INITIALS	3 INITIALS
30	FREE PLAY	NO
31	CUSTOM MESSAGE	ON
32	FLASH LAMP POWER	NORMAL
33	COIL PULSE POWER	NORMAL
34	KNOCKER VOLUME	NORMAL
35	GAME RESTART	YES
36	BILL VALIDATOR	NO
37	BKGRND MUSIC VOLUME	01
38*	FREEZE TIME	0:09
39	UK POST SAVE ENABLED	NO
40	TIMED PLUNGER	OFF
41	FLIPPER BALL LAUNCH	DISABLED
42	COINDOOR BALL SAVER	NO
43	COMPETITION MODE	NO
44	CONSOLATION BALL	NO
45	FAST BOOT	YES
46	Q24 OPTION	COIN METER
47	TICKET DISP. INSTALLED	NO
48	ALLOW PLAYER COMP. MODE	YES
49	TECH ALERT WARNING	NEVER
50	TEAM SCORES	NO
51	LOCATION ID	00
52	GAME ID	00
53	FLIPPER ADJ 1	20
54	FLIPPER ADJ 2	50
55	FLIPPER ADJ 3	3
Note	: Adjustments and/or variables are subject to change (w	vith or without notice).

* Defaults are subject to change during production (especially 02, 04, 07, 09, 10, 13, 23-27 & 38).

Note: If Game & Display ROMs other than USA are installed, along with the proper Dip Switch Settings, different Defaults will appear. If changes are made (or your Defaults are not USA), enter them with pencil in the YOUR SETTING spaces provided for reference.









FEATURE ADJUSTMENTS 01-35 🖾 = 🦠





Nr.	ADJUSTMENT NAME	USA Default	YOUR SETTING
01	BONUS CARRYOVER	NO	
02	POPS LIT GAME START	01	
03	EXTRA BALL MEMORY	YES	
04	CAR START POSITION	10	
05	GARAGE READY HITS	02	
06	FLAGS LIT G.START	02	
07	LOCK DIFFICULTY	MODERATE	
08	RACE LTRS GAME START	01	
09	RACE LTR ASSIST	YES	
10	SPELL RACE GAME START	02	
11	HAPPY HOUR GOAL	01	
12	INFIELD PARTY GOAL	01	
13	SHORT TRACK GOAL	01	
14	TEST CAR GOAL	01	
15	HAULER RIDE GOAL	01	
16	BUMP N RUN GOAL	01	

Nr.	ADJUSTMENT NAME	USA Default	YOUR Setting
17	RIGHT SIDES GOAL	01	
18	SUPERFAN GOAL	01	
19	GAS N GO GOAL	01	
20	LAPS TO ROAD COURSE	30	
21	LAPS TO NEXT ROAD	25	
22	SMART BALL SAVER	YES	
23	MODE TIME SECONDS	25	
24	MAX BALL SAVERS	1	
25	TRACK SAVER	YES	
26	EMPTY LOCKS AT G.O.	YES	
27	DISABLE TRACK	NO	
28	SPOT UNLIT SCANNER	YES	
29	TRACK ADJUST 1	00	
30	TRACK ADJUST 2	00	
31- 35	PROPRIETARY 1-5	vari (proprieta	

Section 3, Chapter 4 Page 38





Go To Adjustments Menu

Overview

The Portals[™] Service Menu System provides 90 Adjustments to vary Game Functions to customize for your particular needs. The Adjustments are divided into 2 groups: • Standard Adjustments (01-55) and • Feature Adjustments (01-35). Game code may get upgraded during production; compare all Adjustments in the display with the manual and make any corrections to the Adjustment Table (previous page), as necessary. Adjustments are subject to change (with or without notice). To view Adjustments in the display, enter the **Portals**™ **Service Menu System**. When a change is made and then the next / previous Adjustment is selected (or the Sub-Menu is exited), the display will momentarily flash REQUEST INSTALLED. For further customization of Game Play Difficulty or Game Play Type or how to RESET ONLY the Adjustments, see Section 3, Chapter 5, GO TO INSTALLS MENU.



Important: The Coin Door must be OPEN allowing the Memory Protect Switch to be disabled, so any Adjustment changes can be made.



EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

Select and activate to:











These non-selectable lcons appear in the selected Menu only when there are MORE Icons to the LEFT or to the RIGHT available for selection.

PREVIOUS Menu.

returns to the Attract Mode.

Select and activate Select and activate to return to the to QUIT, exits & to view HELP Screens of the current Menu*

* Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.

GO TO ADJUSTMENTS MENU

After entering **Portals**[™], the **MAIN MENU** now appears. Select the "ADJ" *Icon* in the **MAIN MENU** with either the **Red** "LEFT" or **Green** "RIGHT" **Buttons** (the **Flipper Buttons** operates in the same manner) and press the Black "ENTER" Button (the Start Button operates in the same manner). The

ADJUSTMENTS MENU appears. Continue through this chapter for the explanation & usage of the Icons in the ADJUSTMENTS MENU.

Standard Adjustments (01-55) 11 11

To initiate, from the ADJUSTMENTS MENU, select the "S.P.I." Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Select and activate either of the ">>" Mini-Icons to view the next or previous Adjustment in this group. Select and activate either of the "-" or "+" Mini-Icons to change the setting, if desired (the Default Setting is noted in the definitions below). The display will describe the Adjustment Number, Adjustment Name and the Current Adjustment Setting. The current Adjustment will remain in the display until the next Adjustment is view or when this Menu is exited.

G: Changes made in any Adjustments will be lost after a FACTORY RESET or removal of the CPU/ STANDARD ADJUSTMENT NAME: Definition Nr.

REPLAY TYPE: Set to AUTO, DYNAMIC, FIXED or NONE. Default is AUTO. Selecting NONE will make Standard Adjustments 2-5 NOT AVAILABLE. Selecting FIXED will make Standard Adjustment 2 NOT AVAILABLE. If selected AUTO, DYNAMIC or FIXED, you will need to then select the number of Replay 01 Levels and Score Threshold (in Standard Adj. 4) desired for the player to receive a Replay Award (select type in Standard Adj. 3). The Default Score appears as a starting point after the Level amount is selected. AUTO & DYNAMIC will then get based on the Replay Percentage (in Standard Adjustment 2).

• Select **FIXED** to give the player a Replay Award as the Score Threshold is reached. This Score Threshold **will not** adjust up or down. • Select **AUTO** to give the player a Replay Award as the Score Threshold is reached. This Score Threshold will automatically adjust up or down based on the Replay Percentage chosen (in Std. Adj. 2). The game periodically adjusts based upon the Player Base Skill Level. • Select **DYNAMIC** to give the player a Replay Award as the Score Threshold is reached. This Score Threshold will go down every game based on the Replay Percentage selected. For (Dynamic) example, if the Score Threshold is 50,000,00 and the Replay Percentage selected is 10%, every game a player does not reach the Score Threshold, the score to reach will drop by 5,000,000 (10% of 50M). This will continue every game until the Threshold Score is reached. Thus, if the score then drops to 15,000,000 after 7 games and is then achieved, the Replay Award is given. The original Score Threshold is added to 15,000,000 and is now 65,000,000. It will then take the same player 10 games to reach 15,000,000. reach 15,000,000.

REPLAY PERCENTAGE: Set between **01% - 50**. Default is **10%**. This Adjustment is required if Standard 02 Adjustment 1 is set to AUTO or DYNAMIC.

Standard Adjustments 03-11 continued on the next page.

Go To Adjustments Menu



STANDARD ADJUSTMENT NAME: Definition

REPLAY AWARD: Set to EXTRA BALL, CREDIT, TICKET* or TOKEN*. Default is CREDIT. Select EXTRA 03 BALL if awarding a CREDIT, TICKET/TOKEN is prohibited in your area

- REPLAY LEVELS: Set between 1 4 for the number of Replay Levels to be active. Default is 1: 20,000,00. A "Drop-Down" Table appears showing Replay Level 1. Adjust the Replay Level between 10M - 9.99B (Default Score appears as a starting point) using the "-" or "+" Mini-Icons, then use the ">>" Mini-Icon to 04 go to next Level (if selected more than 1) and select the next highest Threshold Score(s) desired.
- REPLAY BOOST: Set to YES or NO. Default is YES. This Adjustment works only when Standard 05 Adjustment 1, Replay Type, is set to FIXED or AUTO.

When set to **YES**, while **FIXED** or **AUTO** maintains the Replay Levels, Replay Boost works as follows: If the Replay Level is 7,000,000 (regardless of the Replay Percentage), and the Player scores 20M, and receives the Replay Award, the next game the Current Replay Level is added to this base. Thus the next game, the Replay Level is 14,000,000. The Player agains scores 20M. The next game the Player will need to achieve 21,000,00 to earn the Replay Award. If the Player does not achieve 21,000,000, the next game reverts back to the original 7,000,000 or the new adjusted level maintained by the Fixed or Autopercentaging Feature.

- SPECIAL AWARD: Set to EXTRA BALL, CREDIT, TICKET*, TOKEN* or POINTS. Default is CREDIT. 06 Select EXTRA BALL or POINTS if awarding a CREDIT or TICKET/TOKEN is prohibited in your area.
- **SPECIAL PERCENTAGE:** Set between 1% 5%. Default is 0%. This adjustment allows the operator to 07 adjust how frequently the **Special Feature** is made available to the player.
- FREE GAME LIMIT: Set between 01 09. NO FREE GAMES or UNLIMITED. Default is 05. Set the 80 maximum number of *Free Games* that may be accumulated per game.
- EXTRA BALL LIMIT: Set between 01 09, NO EXTRA BALLS or UNLIMITED. Default is 09. Set the 09 number of Extra Balls that may be accumulated per game.
- EXTRA BALL PERCENTAGE: Set between 01% 50%. Default is 25%. This adjustment allows the 10 operator to adjust how frequently the *Extra Ball Feature* is made available to the player.
- **GAME PRICING:** There are two (2) methods available for *Coin Switch Programming*: **Standard** & **Custom**. 11 Set between USA 1 thru EURO 12 or CUSTOM. USA Factory Default Setting is USA 5.

USA Standard Pricing Select Table

					_				
CPU/SOUND BOARD DIP SWITCH 300 SETTING	COUNTRY SETTING OPTION(S)		S THR CENTER	U S	CHES) LOT: 4TH	Number of Plays	RICING SCHEI s (Credits) for Price J" for Coin Cards I	e Amount Shown	Requires SPI Coin Card(s) Part Number
Pos. 1 2 3 4 5 6 7 8	Alternate Settings								
ON	USA 1					1 /\$.25			755-5400-01-Y
OFF	USA 2					1 /\$.50	2 /\$.75	3 /\$1.00	755-5400-02-Y
	USA 3					1 /\$.50			755-5400-02-Y
	USA 4					1 /\$.50	For USA Defaul	lts 6 & 7 use:	755-5400-02-Y
	USA 5	\$.25	\$1.00	\$.25)	1 /\$.50	5 /\$2.00	755-5400-02	755-5400-00-Y
	USA 6					1 /\$.50	2 /'4 X 25¢'	3 /\$1.00 Bill	■ Used to promote
	USA 7					1 /\$.50	4 /\$1.50	6 /\$2.00	the Bill Validator.
	USA 8					1 /\$.50	3 /\$1.00		755-5400-00-Y
	USA 9					1 /\$1.00			755-5400-07- <mark>Y</mark>

The **Dip Switch Settings (Sw. 300)** on the **CPU/Sound Board** for each Country *must match with what is shown in the USA & Int'l.* Standard Pricing Select Tables for your country to have correct operation (see the next page). For a Standard Selection (USA or International): Select & activate either of the "-" or "+" Mini-Icons to move backward or forward in the Display; With your choice appearing in the display, select & activate the ">>" Mini-Icon to advance and "lock-in" the change (display will momentarily flash REQUEST INSTALLED)

If **CUSTOM** is selected (appears in display), after selecting & activating any Mini-Icon (except for "-" or "+"), the display will momentarily flash **REQUEST INSTALLED** with the display "**LEFT COIN: 0 PULSE**" appearing. Use the "<<" or ">>" Mini-Icons to **select** the next choice (see Table Examples below) and the "-" or "+" Mini-Icons to **customize** the PULSES, CREDITS & CLICKS from **0** to **99**.

The prescribed number of PULSES required for 1 CREDIT must be set according to the Pricing Scheme desired. Some simple calculations are required to get the proper set-up. After customizing, *test* the set-up with appropriate Coins or Bills and adjust, if necessary. *Note:* Clicks can be changed if an optional Coin Meter is installed.

Examples:

In **Example 1**, note the **LEFT** (and **RIGHT**) **COIN: 3 PULSES** and **ONE CREDIT: 4 PULSES**. Since every Coin inserted produces 3 Pulses & every Credit requires 4 Pulses, 2 Coins (50¢) will produce 6 Pulses (4 Pulses for the 1st Credit + 2 Pulses remains in escrow). The 3rd Coin (75¢) provides another 3 Pulses for a total of 5 Pulses (4 Pulses for the 2nd Credit + 1 Pulse remains in escrow). The 4th Coin (\$1.00) provides another 3 Pulses for a total of 4 Pulses (4 Pulses for the 3rd Credit + 0 Pulses remain). The CENTER COIN: 12 PULSES is set this way (with a Bill Validator attached); every \$1-Bill inserted produces 12 Pulses or 3 Credits.

LEFT	CENTER	RIGHT	4TH	ı	Example [·]	1	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:	ONE CREDIT:	BONUS 1:	BONUS 2:	BONUS 1:	BONUS 2:	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:
25¢	\$1.00	25¢	Not Used	1 /50¢	2 /75¢	3/ \$1.00	3	12	3	1	4	0	0	0	0	1	4	1	1
Coin	Mecha	nisms	Used	Pricing	Scheme	Desired	PULSES	PULSES	PULSES	PULSE	PULSES	PULSES	PULSES	CREDITS	CREDITS	CLICK	CLICKS	CLICK	CLICK

Standard Adjustment 11, Custom Pricing, continued on the next page.

Section 3, Chapter 4 Page 40





Standard Adjustment 11 Continued. 💶 🕩 🗏 🛨

STANDARD ADJUSTMENT NAME: Definition

In **Example 2**, similar to Example 1, however, **BONUS CREDITS** are implemented. In addition to receiving 3 plays for every \$1.00, the player is awarded an extra Credit for every 2nd dollar inserted before game start.

LEFT	CENTER	RIGHT	4TH	l	Example	2	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:	ONE CREDIT:	BONUS 1:	BONUS 2:	BONUS 1:		LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:
25¢	\$1.00	25¢	Not Used	1 /50¢	2 /75¢	7/ \$2.00	3	12	3	1	4	24	0	1	0	1	4	1	1
Coin	Coin Mechanisms Used Pricing Scheme Desired		PULSES	PULSES	PULSES	PULSE	PULSES	PULSES	PULSES	CREDIT	CREDITS	CLICK	CLICKS	CLICK	CLICK				

In **Example 3**, a **Pricing Scheme** for a cheaper game is shown. An extra Pulse is put in escrow for every 25¢, thus at 4X 25¢ inserted, another Credit is given, and the **BONUS 1: 20 PULSES** threshold is also met, so 6/\$1.00 is achieved. **BONUS 2: 40 PULSES** is set, so when this threshold is met with \$2.00, 13 Credits are produced.

LEFT	CENTER	RIGHT	4TH	!	Example 3	3	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:	ONE CREDIT:	BONUS 1:	BONUS 2:	BONUS 1:	BONUS 2:	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:
25¢	\$1.00	25¢	Not Used	1 /25¢	6/ \$1.00	13/\$2.00	5	20	5	0	4	20	40	1	0	1	4	1	1
Coir	Mecha	nisms	Used	Pricing	Scheme	Desired	PULSES	PULSES	PULSES	PULSES	PULSES	PULSES	PULSES	CREDIT	CREDITS	CLICK	CLICKS	CLICK	CLICK

In **Example 4**, a **Pricing Scheme** using a different currency (i.e. British Sterling) is shown to provide another way coins (or tokens) can be utilized to custom tailor to your own needs.

LEFT	CENTER	RIGHT	4TH	ı	Example 4	1	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:	ONE CREDIT:	BONUS 1:	BONUS 2:	BONUS 1:	BONUS 2:	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:
10p	50p	£1	20p	1 /30p	2 /50p	5 /£1	1	6	15	2	3	0	0	0	0	1	4	1	1
Coin	Mecha	nisms	Used	Pricing	Pricing Scheme Desired		PULSE	PULSES	PULSES	PULSES	PULSES	PULSES	PULSES	CREDITS	CREDITS	CLICK	CLICKS	CLICK	CLICK

International (non-Euro) Standard Pricing Select Table

	IIIIemano	•		•		ricing of	sieci iau	le .	
CPU/SOUND BOARD	COUNTRY	COIN I	MECHANIS	SMS (SWI	rches)	PF	RICING SCHE	ME	Requires SPI
DIP SWITCH 300	SETTING	COIN	S THR	U S	LOT:	Number of Plays	(Credits) for Price	e Amount Shown	Coin Card(s)
SETTING	OPTION(S)	LEFT	CENTER	RIGHT	4TH	See "Appendix	J" for Coin Cards	Examples & Info!	Part Number
Pos. 1 2 3 4 5 6 7 8									
ON 🛦 🛦 🛦	Australia 1	20¢	\$A1	\$A2)		3 /\$A2		755-5406-00-Y
OFF ▼ ▼ ▼ ▼	Australia 2	20¢	ΨΑΙ	ΨΛΖ		1 /\$A1			(Side 1)
Pos. 1 2 3 4 5 6 7 8			1	1				T	755 5400 00 V
ON A A	Canada	Can\$.25	Can\$.25	Can\$1	Can\$2	1 /50¢	2 /75¢	3/ Can\$1	755-5400-00-Y
OFF						,			-01-Y or -02-Y
Pos. 1 2 3 4 5 6 7 8									755-5410-00-Y
OFF V V V	Croatia	1 kuna	2 kuna	5 kuna		1 /3 kuna	2 /5 kuna		(2-Sided)
Pos. 1 2 3 4 5 6 7 8			1	1					(
ON 🛕 🛕	Denmark 1	1 DV:	E DIA	10 DV:	00 DK*	1 /3 DKr	2 /5 DKr		755-5402-00-Y
OFF ▼ ▼ ▼ ▼	Denmark 2	1 DKr	5 DKr	10 DKr	20 DKr	1 /2 DKr	3 /5 DKr	7 /10 DKr	(2-Sided)
Pos. 1 2 3 4 5 6 7 8									
ON A A	Japan 1	100¥		100¥		1 /100¥		7	755-5408-01-Y
OFF ▼ ▼ ▼ ▼	Japan 2	100+		100+	3)	1 /100¥	3 /200¥		(2-Sided)
Pos. 1 2 3 4 5 6 7 8		1							
ON A A A	Middle East	token		token		1 /1 token			755-5400-06-Y
OFF V V						.,			(use Side 1)
Pos. 1 2 3 4 5 6 7 8	New Zealand 1					1 /\$NZ1			755-5406-00-Y
OFF V V V V	New Zealand 2	\$NZ1		\$NZ2	,	1 /\$NZ1	3 /\$NZ2	1	(Side 2)
Pos. 1 2 3 4 5 6 7 8	INEW Zealai lu Z					Ι/ΦΙΝΖΙ	3/911422		(Glac 2)
ON A A	Norway 1	40 NIC	E NUZ	00 1116	>	1 /10 NKr			755-5403-01-Y
OFF ▼ ▼ ▼ ▼ ▼	Norway 2	10 NKr	5 NKr	20 NKr		1 /10 NKr	3 /20 NKr		(2-Sided)
Pos. 1 2 3 4 5 6 7 8				T					
ON A A	Russia	10 Ruble	5 Ruble	1 Ruble		1 /5 Rubles	Note: Left S		755-5411-00-Y
OFF ▼ ▼ ▼ ▼	Huoolu	10 Hubic	O Hubic	1 110010		1701100100	wired to Bill I	Acceptor	(2-Sided)
Pos. 1 2 3 4 5 6 7 8									755-5409-01-Y
OFF V V V V	South Africa	50c	R1	R2	R5	1 /R2			(2-Sided)
Pos. 1 2 3 4 5 6 7 8				1					(2 Glaca)
ON A A	Sweden 1	4.014	5.014	40.014)	1 /10 SKr	2 /15 SKr	3 /20 SKr	755-5404-00-Y
OFF V V V	Sweden 2	1 SKr	5 SKr	10 SKr		1 /5 SKr		0,200	(2-Sided)
Pos. 1 2 3 4 5 6 7 8									
ON A A	Taiwan	TWD10		TWD10		1 /TWD10			755-5412-00-Y
OFF V V V	Taiwaii	100010		100		171110			(used Side 1)
Pos. 1 2 3 4 5 6 7 8	0					4 4 0 5	0/50 5		755-5405-00-Y
ON A A	Switzerland 1	1 SwF	2 SwF	5 SwF)	. , . •	6 /5 SwF	0 /F CF	(2-Sided)
OFF V V V V	Switzerland 2	LEET	DENIED DIA	DUT ATIL	CTI	1 /1 SwF	3 /2 SwF	9 /5 SwF	
Pos. 1 2 3 4 5 6 7 8	UK 1	LEFT (CENTER RIC	HT 4TH	5TH	3 /£1	the 5th Coin Slot Switch	ii (iiot avaliable with Cu	755-5407-00-Y
OFF V V V	UK 2					3 /£1 4 /£1	1 /24		755-5407-01-Y*
	UK 3					1 /50p	5 /£2	1	755-5407-01
	UK 4	10p	50p £	1 20p	£2	1 /30p	4 /£1		755-5407-01- Y *
	UK 5				22	1 /£1	3 /£2		755-5407-01
	UK 6					3/£2	0 / 22	*use blank side	755-5407-01- Y *
	0.00								

Note: The Country Setting Option above noted with "«" & "»" denotes the Factory Default Setting (subject to change).

Standard Adjustment 11, Custom Pricing, and Std. Adj. 12-17 continued on the next page.

Go To Adjustments Menu





Standard Adjustment 11 Continued. 🔣 📭 🗏 🛨

STANDARD ADJUSTMENT NAME: Definition

Euro 1-12 Summary & International (Euro) Standard Pricing Select Table

		0			,				
CPU/SOUND BOARD DIP SWITCH 300 SETTING	COUNTRY SETTING OPTION(S)		MECHANIS S THR CENTER		TCHES) S L O T : 4TH	Number of Plays	RICING SCHEI (Credits) for Price J" for Coin Cards I	Amount Shown	Requires SPI Coin Card(s) Part Number
Pos. 1 2 3 4 5 6 7 8									
ON SEEBELOW	Euro 1					1 /€.50			755-5401-01-Y
OFF S E T T I N G S	Euro 2					1 /€.50	5 /€2.00		755-5401-02-Y
Euro 1-12 are alternate settings for	Euro 3					1 /€.50	3 /€1.00		755-5401-03-Y
Euro 1-12 are alternate settings for countries using the Euro: If choosing an alternate Euro Setting other than your Country's Default,	Euro 4					1 /€.50	6 /€2.00		755-5401-04-Y
	Euro 5				optional	1 /€.50	3 /€1.00	7 /€2.00	755-5401-05-Y
please remember to use your	Euro 6	€.50	€1.00	€2.00	€.20	2 /€.50			755-5401-06-Y
Country Dip Switch Setting.	Euro 7	0.00	01.00	02.00	optional	1 /€1.00	5 /€4.00		755-5401-07-Y
	Euro 8				7	1 /€1.00	3 /€2.00		755-5401-08-Y
	Euro 9					1 /€1.00	2 /€1.50	3 /€2.00	755-5401-09-Y
	Euro 10					1 /€1.00	3 /€2.00	7 /€3.00	755-5401-10-Y
	Euro 11					1 /€1.00	4 /€2.00		755-5401-11-Y
	Euro 12					2 /€1.00	9 /€4.00		755-5401-12-Y

For a different Euro Pricing Scheme (other than below default), scroll through Standard Adjustment 11: Euro 1-12 or CUSTOM* for new setting (reference above Euro 1-12 Summary). * Note: Unique Coin Door & Mech. for Germany, Italy & Portugal must use CUSTOM.

Pos. 1 2 3 4 5 6 7 8	·								
ON 🛦	Austria	€.50	€1.00	€2.00		1 /€1.00	2 /€1.50	3 /€2.00	755-5401-09-Y
OFF ▼ ▼ ▼ ▼ ▼	Euro 9	€.50	€1.00	€2.00		17€1.00	2/€1.50	3/~2.00	
Pos. 1 2 3 4 5 6 7 8									
ON A	Belgium	€.50	€1.00	€2.00		1 /€.50			755-5401-01-Y
OFF ▼ ▼ ▼ ▼ ▼	Euro 1	C.30	C1.00	02.00		170.50			
Pos. 1 2 3 4 5 6 7 8									
ON 🛕 🛕	Finland	€.50	€1.00	€2.00		1 /€1.00	3 /€2.00		755-5401-08-Y
OFF ▼ ▼ ▼ ▼ ▼	Euro 8	0.00	01.00	CZ.00		1701.00	0702.00		
Pos. 1 2 3 4 5 6 7 8									TEE E 404 40 W
ON A A	France	0,50 €	1,00 €	2,00 €		1 /1,00 €	3 /2.00 €	7 /3.00 €	755-5401-10-Y
OFF ▼ ▼ ▼ ▼ ▼	Euro 10	0,00	.,000	_,000		.,.,	072,00	. , 0,00	
Pos. 1 2 3 4 5 6 7 8	0					4 /0 50 /			755-5401-01-Y
ON A A A	Germany 1	C0.50	C4 00	C0.00		1 /0,50¢	F / CO 00	1	
OFF ▼ ▼ ▼ ▼	Germany 2	€0,50	€1,00	€2,00))	, , , , , ,	5 /€2,00		-02-Y or -04-Y
	Germany 3					1 /0,50¢	6 /€2,00		
Pos. 1 2 3 4 5 6 7 8	0								755-5401-06-Y
	Greece	€.50	€1.00	€2.00		2 /€.50			755-5401-06-1
0FF	Euro 6								
Pos. 1 2 3 4 5 6 7 8	liabi 1					1 / 504			755-5401-01-Y
OFF V V V V	Italy 1	€.50		€.50))	1 /.50¢ 1 /€1.00	3 /€2.00	1	or -08-Y
Pos. 1 2 3 4 5 6 7 8	Italy 2					17€1.00	3 /€2.00		07 -06-1
ON A 3 6 7 8	Netherlands								755-5401-03-Y
OFF V V V V V	Euro 3	€.50	€1.00	€2.00		1 /€.50	3 /€1.00		100 0 101 00 1
Pos. 1 2 3 4 5 6 7 8	Luio 3								
ON A A A									755-5401-01-Y
OFF VVV	Portugal	€.50		€.50		1 /€.50			
Pos. 1 2 3 4 5 6 7 8									
ON A A	Spain	C 50	C4 00	C0.00		4.10.50	0.104.00		755-5401-03-Y
OFF V V V V	Euro 3	€.50	€1.00	€2.00		1 /€.50	3 /€1.00		
				1					

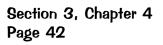
Note: The Country Setting Option above noted with "«" & "»" denotes the Factory Default Setting (subject to change).

12 MATCH AWARD: Set to CREDIT, TICKET* or TOKEN*. Default is CREDIT

*If TICKET or TOKEN is selected, the game will require an optional Ticket or Token Dispenser If selected Token, then Standard Ajustment 46, Q24 Option, must be changed accordingly.

- MATCH PERCENTAGE: Set between 0% 10% or OFF. Default is 9%. At 0% the match display occurs at the end of the game but never awards a Credit. Set to OFF, no *Match Animation Feature* is shown.
- 14 BALLS PER GAME: Set between 02 10. Default is 03. Set the number of balls per game.
- 15 **TILT WARNINGS:** Set to **00**, **01** or **03**. Default is **01**. Set the number of Plumb Bob Tilt Switch closures before the ball in play is tilted.
- 16 CREDIT LIMIT: Set between 04 50. Default is 30. Set the maximum credits allowed.
- ALLOW HIGH SCORES: Set to YES or NO. Default is YES. When set to YES if a player exceeds any 1 of the 4 High Scores, the player may receive an award (depending on Standard Adjustment 03, Replay Award). Set to NO to disable this feature. There are 5 High Scores that will allow the player to enter their initials (or name) (see Standard Adjustment 29, High Score Initials).

Standard Adjustments 18-38 continued on the next page.







Standard Adjustments Continued. 🔣 🕦 🗏 🖠

STANDARD ADJUSTMENT NAME: Definition

- **GRAND CHAMPION AWARDS:** Set between **00 05**. Default is **01**. Set the number of awards, awarded for exceeding Level 1 (the highest of the five (5) Levels).
- 19 HIGH SCORE #1 AWARDS: Set between 00 03. Default is 01. Set the number of awards, awarded for exceeding Level 2.
- 20 HIGH SCORE #2 AWARDS: Set between 00 02. Default is 00. Set the number of awards, awarded for exceeding Level 3.
- 21 HIGH SCORE #3 AWARDS: Set between 00 01. Default is 00. Set the number of awards, awarded for exceeding Level 4.
- 22 HIGH SCORE #4 AWARDS: Set between 00 01. Default is 00. Set the number of awards, awarded for exceeding Level 5.
- GRAND CHAMPION SCORE: Set between 1,000,000 9,999,000,000 or 00 (increments of 1M). Default is 100,000,000. Set the desired *High Score Level* to which Level 1 may be achieved. A score higher than the default, cannot be reset by Standard Adjustment 28, HSTD Reset Count. The High Score will revert to the Default Score ONLY if a Factory Reset is done or the batteries are removed from the CPU/Snd. Bd.
- DEFAULT HIGH SCORE #1: Set between 1,000,000 9,999,000,000 or 00 (increments of 1M). Default is 65,000,000. Set the desired *High Score Level* to which Level 2 may be achieved. Read Std. Adj. 28.
- DEFAULT HIGH SCORE #2: Set between 1,000,000 9,999,000,000 or 00 (increments of 1M). Default is 55,000,000. Set the desired *High Score Level* to which Level 3 may be achieved. Read Std. Adj. 28.
- DEFAULT HIGH SCORE #3: Set between 1,000,000 9,999,000,000 or 00 (increments of 1M). Default is 50,000,000. Set the desired *High Score Level* to which Level 4 may be achieved. Read Std. Adj. 28.
- **DEFAULT HIGH SCORE #4:** Set between 1,000,000 9,999,000,000 or 00 (increments of 1M). Default is 45,000,000. Set the desired *High Score Level* to which Level 5 may be achieved. *Read Std. Adj. 28*.
- HSTD RESET COUNT: Set between 100 9,900 or OFF (increments of 100). Default is 2,000. HSTD (High Score To Date). Set the number of games between "automatic resets of High Score Levels" to "Default Scores" for ONLY Standard Adj. 24-27, Default High Score #1-#4.
- HIGH SCORE INITIALS: Set to 3 INITIALS or 10 LETTER. Default is 3 INITIALS. When set to 3 INITIALS, the player is allowed only 3 initials to input. When set to 10 LETTER NAME, the player is allowed to enter 10 initials to input.
- FREE PLAY: Set to YES or NO. Default is NO. When set to YES, no coins are required for Game Play.
- CUSTOM MESSAGE: Set to ON, CHANGE or OFF. Default is ON. When set to CHANGE, a new message can be set or the old one can be edited (select the "+" Mini-Icon to change settings until "CHANGE" appears in the display, then select the ">>" Mini-Icon to access.). This adjustment can be accessed in two (2) ways by either selecting the "S.P.I." Icon and advancing to this Adjustment, or can be directly accessed by selecting the "ABCD CUST MSG" Icon in the ADJUSTMENTS MENU.

 View the Custom Message Shortcut summary (end of this chapter) for how to enter text or symbols.
- **FLASH LAMP POWER:** Set to **NORMAL**, **DIM** or **OFF**. Default is **NORMAL**. When set to **DIM**, the Flash Lamps impulse power is reduced by **25**% and when set to **OFF** the Flash Lamps will not flash.
- COIL PULSE POWER: Set to NORMAL, HARD or SOFT. Default is NORMAL. When set to HARD, the coil pulse power is *increased* by 12.5% of the normal pulse rate. When set to SOFT the coil pulse power is *decreased* by 12.5% of the normal pulse rate. This adj. is provided to compensate for *Low Line* or *High Line voltage* conditions where the solenoids (coils) appear to *kicking too weak or too hard*. Adjust as required.
- **KNOCKER VOLUME:** Set to **NORMAL, LOW** or **OFF**. Default is **NORMAL**. When set to **LOW**, the volume is decreased 50%. When set to **OFF**, no sound is heard when the "knocker" is sounded.
- GAME RESTART: Set to YES or NO. Default is YES. When set to YES, a new game may be started during any ball after the first ball is completed (*if credits are available*). Pressing the Start Button during the first ball will add additional players. When set to NO, the game disables the Start Button after the first ball until the final ball is in play. Review Sec. 2, Chp. 1, GAME OPERATIONS & FEATURES, for details.
- **BILL VALIDATOR:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, in *Game Attract Mode* the Display will show an "*Insert Bill Animation*." When set to **NO**, the Display will show an "*Insert Coin Animation*."
- BKGRND (BACKGROUND) MUSIC VOLUME: Set between 01 15. Default is 01. After volume is set via Portals Service Buttons (see Section 3, Chapter 1, PORTALS™ SERVICE MENU INTRODUCTION) this adjustment can be utilized to adjust the background music (1 all the way on, 15 all the way off) while keeping the Special Sound FX the same level.
- FREEZE TIME (BALL SAVE): Set to OFF, 0:01-0:15 or AUTO. Default is 0:09. When set to OFF this feature is unavailable. Set between 0:01 through 0:15 (single increments) for the ball to be sent back into play if the time set is not met (per ball). Set to AUTO to automatically adjust the Freeze Timer based on the average ball time.

Standard Adjustments 39-52 continued on the next page.





Standard Adjustments Continued. 11 11 11

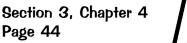
STANDARD ADJUSTMENT NAME: Definition

UK ONLY Dip Switch Must Be Set

- 39 UK POST SAVE ENABLED: Set to YES or NO. Default is NO, (UK Default is YES). When set to YES this feature is available when lit. Set to NO to disable this feature. (UK Games have Outlane/Center Post Save Devices which are accessed in differently; Non-UK Games cannot adjust this setting.)
- **TIMED PLUNGER:** Set to **OFF** or **0:15 1:00**. Default is **OFF**. When set to **0:15** to **1:00**, the plunger will "Autoplunge" the ball *(at the time set)* when the ball is at the beginning of play, awaiting the skill shot by the player.
- FLIPPER BALL LAUNCH: Set to DISABLED, LEFT FLIPPER, RIGHT FLIPPER, EITHER FLIPPER or BOTH FLIPPERS. Default is DISABLED. This feature allows the player to operate the *Auto Ball Launch* with the FLIPPER BUTTON(S) depending on which setting is chosen.
- COINDOOR BALL SAVER: Set to YES or NO. Default is NO. When set to NO, this feature is not available. When set to YES, this feature allows the Coin Door to be opened during game play; the ball will drain but the game will be placed "on hold". When the Coin Door is closed, the pinball will return to the Shooter Lane, and the game will resume.
- COMPETITION MODE: Set to YES or NO. Default is NO. When set to NO, this feature is not available. If an Install of either \$.50 or Free Play Comp. was made (changing default to YES), and was changed back to NO, the COMPETITION MODE will be turned OFF (see Sec. 3, Chp. 5, GO TO INSTALLS MENU, \$.50 or Free Play Competition). Set to YES, this feature is available (required for Competition Modes); this feature will equalize random game features and global score values during multi-player games.
- 44 CONSOLATION BALL: Set to YES or NO. Default is NO. When set to YES, the EXTRA BALL (Playfield Light Insert, location varies) will be lit on the last ball in play, if certain programming criteria is met.
- FAST BOOT: Set to YES or NO. Default is YES. When set to NO or if you hold the RIGHT Flipper Button during Power-Up, this feature is not available and will display all normal Power-Up screens. When set to YES, the game will not display the normal informative Power-Up screens, specifically the CPU Version screen and the Location/Game ID screen. Regardless of the setting, normal Power-Up safety checks are still performed.
- **Q24 OPTION:** Set to **COIN METER**, **TOKEN DISPENSER** or **KNOCKER**. Default is **COIN METER**. This Coil (Solenoid) Location is left "open" at the Factory to allow for these optional Mechanisms to be added to the game. If selecting **TOKEN DISPENSER**, Standard Adjustments 03, 06 & 12 should be changed to **TOKEN**. *Call Technical Support at 1-800-542-5377 if more information is required on this option.*
- TICKET DISP. INSTALLED: Set to YES or NO. Default is NO. This adjustment is required only for games which have an optional Deltronics (DL-1275-2 PCB Style, SPI Part Nr. 515-7275-00) Ticket Dispenser installed. Unique CPU Sound Bd. Dip Switch (Sw. 300) Setting required, changes the Default to YES.
- ALLOW PLAYER COMP. MODE: Set to YES or NO. Default is YES. Competition Mode unrandomizes feature events, and standardizes game play and rule sets (varies from game to game) for fair competitions. With adequate credit, to enter Competition Mode, hold the Flipper Button in while pressing the Start Button. Watch the Dot Display for more details (rules and operation are subject to change). General rules are covered in the Instruction Card. Other Hints and/or Rules can be made known on this game either visually (the Dot Display or Flashing Light Inserts) or can be audible.
- TECH ALERT WARNING: A Portals™ Function. Review Sec. 3, Chp. 2, GO TO DIAGNOSTICS MENU, Page 25, regarding Technician Alerts and its' functions. Set to NEVER, POWERUP, COIN DOOR or POWERUP AND COIN DOOR. Default is NEVER. When set to NEVER, the Tech Report Alert display will not appear upon Power-Up or opening the Coin Door, if the game detects any problems. When set to POWERUP, the display will appear only upon Power-Up (if problems detected). When set to POWERUP AND COIN DOOR, the display will appear upon Power-Up and if the Coin Door is opened (if problems detected).
- TEAM SCORES: Set to YES or NO. Default is NO. Set to YES, then Team Play will be made available.

 Team Play only works in a 4-Player Game. The totals for Players 1 / 3 (Team 1) & Players 2 / 4 (Team 2) are then displayed individually as well as the combined score for BOTHTEAMS to enable Team Play (Doubles). See Section 2, Chapter 1, Game Operation & Features, for non-adjustable Features.
- **LOCATION ID:** Set between **00** to **9999**. Default is **00**. This adjustment allows thxe operator to assign a location identification number to the audit print-out sheet. (Will not be affected by Factory Reset.)
- **GAME ID:** Set between **00** to **9999**. Default is **00**. This adjustment allows the operator to assign a game identification number to the audit print-out sheet. (Will not be affected by Factory Reset.)
- **FLIPPER ADJ 1:** Set between **05** to **40**. Default is **20**. This adjustment sets the *minimum* fire time for a flipper coil in milliseconds.
- **FLIPPER ADJ 2:** Set between **40** to **60**. Default is **50**. This adjustment sets the *maximum* fire time for a flipper coil in milliseconds.

Standard Adjustment 55 continued on the next page.







Nr.

Go To

Standard Adjustments Continued. 💶 📭

STANDARD ADJUSTMENT NAME: Definition

FLIPPER ADJ 3: Set between 0 to 10. Default is 3. This adjustment sets the amount of time to fire the coil 55 after the EOS switch is seen in milliseconds.

Standard Adjustments 53-55 Note: • Flippers will now fire when the button is pushed until the End-of-Stroke (EOS) Switch closure is seen. When EOS is seen, continue firing for the amount of time in Std. Adj. 55. When this time is expired, if the minimum time has not yet been met (Std. Adj. 53), then keep firing until it has. Otherwise switch to hold power. • If the flipper has been firing and it reaches the maximum (Std. Adj. 54), then switch to hold power. • If the flipper caves-in (EOS re-closes) while the button is still held, then refire the flipper at full power. Switch to hold power as soon as EOS is seen, no minimum times are enforced in this situation. • If the flipper caves in several times on the same single flipper button press, then stop refiring at full power and just stay at hold. • If the flipper fails to open the EOS switch several times, then assume it isn't working and fall back to a "safe" fire time so as not to burn up the coil.

Feature Adjustments (01-35) HH H

To initiate, from the ADJUSTMENTS MENU, select the "NASC" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Select and activate either of the ">>" Mini-Icons to view the next or previous Adjustment in this group. Select and activate either of the "-" or

"+" Mini-Icons to change the setting, if desired (the Default Setting is noted in the definitions below). The display will describe the Adjustment Number, Adjustment Name and the Current Adjustment Setting. The current Adjustment will remain in the display until the next Adjustment is view or when this Menu is exited.

******* Variables, Game Play, Rules, Settings and Explanation Subject to Change

FEATURE ADJUSTMENT NAME: Definition

- **BONUS CARRYOVER:** Set to **YES** or **NO**. Default is **NO**. Decides if the bonus X should be carried over from ball to ball. DIFFICULTY: YES/YES/NO/NO/NO (EXTRA EASY TO EXTRA HARD) 01
- POPS LIT GAME START: Set between 01 to 05. Default is 02. Sets the number of pop bumpers that will 02 be lit at game start. Choosing 4 will light 2 solid and set 1 blinking, choosing 5 will light 1 solid and set 2 blinking. DIFFICULTY: 3/2/2/1/0
- EXTRA BALL MEMORY: Set to YES or NO. Default is NO. Allows the EXTRA BALL lit from the Garage 03 Award to carry over. DIFFICULTY: YES/YES/YES/NO/NO
- CAR START POSITION: Set between 03 to 10. Default is 08. Chooses the starting position when the 04 player begins the game. DIFF: 4/6/8/10/10
- GARAGE READY HITS: Set between 01 to 03. Default is 02. Chooses how many hits to the TEST CAR 05 are needed to light the Garage Award. DIFF: 1/1/2/2/3
- FLAGS LIT GAME START: Set between 01 to 02. Default is 02. Chooses the number of Checkered Flags 06 lit at the start of a game. DIFF: 2/2/1/0/0
- LOCK DIFFICULTY: Set to EX. EASY, EASY, MODERATE, HARD or EX. HARD. Default is MODERATE. Determines how hard it is for a player to reach RACE MULTIBALL. At harder settings, the player may 07 need to qualify the lock each time to lock a ball. At easier settings, the player can reach multiball quicker. DIFF: EASY/EASY/MEDIUM/HARD/HARD
- RACE LTRS GAME START: Set between 01 to 03. Default is 01. Determines how many R-A-C-E letters 80 to light at game start. DIFF: 2/1/1/0/0
- RACE LETTER ASSIST: Set to YES or NO. Default is YES. Setting Assist to "YES" helps the player by lighting another "Spell R-A-C-E" lamp at the start of a new ball. This is helpful if novice players cannot hit the drop targets to spot these lamps. This assist may also automatically add "Spell R-A-C-E" shots to the 09 game at the start if it's been determined that players are not playing multiball enough. This will override the next adjustment if necessary. If you do not want this behavior to happen, set this adjustment to "NO". DIFF: YES/YES/YES/NO/NO
- SPELL RACE AT GAME START: Set between 00 to 04. Default is 02. Determines how many "Spell 10 R-A-C-E" lamps are lit on the playfield at game start. DIFF: 4/2/2/1/0
- **HAPPY HOUR GOAL:** Set between **01** to **10**. Default is **01**. Sets the number of Happy Hour jackpots 11 needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1/1 SUBJECT TO CHANGE
- INFIELD PARTY GOAL: Set between 01 to 10. Default is 01. Sets the number of Infield Party jackpots 12 needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1/1 SUBJECT TO CHANGE
- SHORT TRACK GOAL: Set between 01 to 10. Default is 01. Sets the number of Short Track jackpots 13 needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1 SUBJECT TO CHANGE
- TEST CAR GOAL: Set between 01 to 10. Default is 01. Sets the number of Test Car jackpots needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1/1 SUBJECT TO CHANGE

Feature Adjustments 15-35 continued on the next page.







FEATURE ADJUSTMENT NAME: Definition

- 15 HAULER RIDE GOAL: Set between 01 to 10. Default is 01. Sets the number of Hauler Ride jackpots needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1/1 SUBJECT TO CHANGE
- **BUMP N RUN GOAL:** Set between **01** to **10**. Default is **01**. Sets the number of Bump N Run jackpots needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1/1 SUBJECT TO CHANGE
- 17 RIGHT SIDES GOAL: Set between 01 to 10. Default is 01. Sets the number of Right Side jackpots needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1/1 SUBJECT TO CHANGE
- SUPERFAN GOAL: Set between 01 to 10. Default is 01. Sets the number of Superfan jackpots needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1/1 SUBJECT TO CHANGE
- **GAS N GO GOAL:** Set between **01** to **10**. Default is **01**. Sets the number of Gas N Go jackpots needed to allow the Mode Bonus to be lit when the mode is over. DIFF: 1/1/1/1/1 SUBJECT TO CHANGE
- 20 LAPS TO ROAD COURSE: S et between 10 to 60. Default is 15. Sets the number of inner track laps needed to light Road Course the first time. DIFF: 10/12/15/20/25
- 21 LAPS TO NEXT ROAD: Set between 10 to 60. Default is 20. This number is added to LAPS TO ROAD COURSE to determine the laps needed for the next Road Course award. DIFF: 10/12/20/30/35
- 22 SMART BALL SAVER: Set to YES or NO. Default is YES. When set to "YES", the game will attempt to get balls back onto the track faster when a ball saver is being used. DIFF: N/C
- MODE TIME SECONDS: Set between 15 to 90. Default is 25. Determines the length of each of the Garage modes. DIFF: 40/35/25/20/20
- MAX BALL SAVERS: Set between 00 to 09. Default is 01. Sets the maximum number of ball savers allowed in the game. DIFF: 3/2/1/0/0
- **TRACK SAVER:** Set to **YES** or **NO**. Default is **YES**. If the ball comes off the racetrack, hits the Test Car, and then drains, the game will give the ball back to the player if this is set to "YES". DIFF: N/C
- **EMPTY LOCKS AT GAMEOVER:** Set to **YES** or **NO**. Default is **YES**. Setting to "YES" will kick all balls out of the Pit Stop lock at the end of a game. DIFF: N/C
- DISABLE TRACK: Set to YES or NO. Default is NO. If the Racetrack magnets or optos have become damaged or are not operational, the game will try to compensate as best as it can. If you know the Racetrack is not functional, setting this adjustment to "YES" will help the game compensate better and more quickly, allowing your players to continue to enjoy the game. DIFF: N/C
- **SPOT UNLIT SCANNER:** Set to **YES** or **NO**. Default is **YES**. If set to "YES", arriving in the Scanner eject when it is not lit for an award will spot one more Checkered Flag standup, advancing the player toward a lit Scanner. DIFF: YES/YES/NO/NO

- 29 30 TRACK ADJUST 1 & 2: For Factory Service Use Only
- 31 35 PROPRIETARY 1-5: For Factory Service Use Only

AECD Custom Message

To go directly to **Standard Adjustment 31, Custom Message,** from the **ADJUSTMENT MENU**, select the "CUST MSG" *Icon* with either the **Red** "LEFT" or **Green** "RIGHT" **Buttons** and press the **Black** "ENTER" **Button**. At the top left corner of the Display, the letter **A** is indicated (*blinking*) in the first available position (*Thirty-Six* (36) characters including spaces are available). Vary the letter(s) by operating the Left and Right Flipper Buttons (or "RED" or "GREEN" Buttons). With the desired letter indicated, depress the **Start Button** to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (*erase*) and/or to move forward in an already typed message. After completion, press the "BLACK" Button, "REQUEST INSTALLED" is indicated and then exits this sub-menu.







For further customization of Game Play Difficulty or Game Play Type or how to RESET ONLY the Adjustments, see Section 3, Chapter 5, GO TO INSTALLS MENU.



Go To Installs Menu

Overview

The Portals™ Service Menu System provides 15 Installs to vary Game Play (Feature Adjustments) Difficulty or Game Play Type and Install Factory (restores all adjustments to Factory Defaults).



Important: The Coin Door must be OPEN allowing the Memory Protect Switch to be disabled, so any Install changes can be made.



For detailed customization or to check current Adjustments Defaults (either changed by YOU in the Adjustments Menu or by this Installs Menu or for Factory Default Settings), see Section 3, Chapter 4, GO TO ADJUSTMENTS MENU. Important: Before preceding, write down any previously changed Adjustment Defaults. After completing one or more of the **Installs** in this Chapter, go back to the **ADJUSTMENTS MENU** to see which Standard and/or Feature Adjustments have changed (Feature Adjustments and/or settings are subject to change during production, and may differ than what is described in the tables at the end of this chapter). If the settings are not to your liking, perform one of the following:

- 1.: Manually change the Standard & Feature Adjustments Settings (perform task in the ADJUSTMENTS MENU, see Section 3, Chapter 4, GO TO ADJUSTMENTS MENU).
- 2.: Install Factory (see opposite this page) on how to reset all of the Standard & Feature Adjustments back to the Factory Default Settings.

Multiple Installs can be set to vary game play; however, for Installs that have one or more Adjustments in common, the last "Install" selected & activated, will supersede any previously changed Adjustment(s) from any prior Installs. Any adjustments which you changed and are not affected by the Install will remain as set.

For example, if you want a 5-BALL Game set to EXTRA EASY: Select and activate the "5BAL" Icon first (which will typically change any Feature Difficulty Adjustments to HARD), then select & activate the "X.EZ" Icon to change back the Difficulty Adjustments to EXTRA EASY. However, if the "X.EZ" Icon was selected & activated first, then the "5BAL" Icon was selected & activated, the game will be set to a 5-BALL Game set to HARD.

EXPLANATION & USAGE OF COMMON LARGE ICONS USED IN THIS MENU:











WARNING: Selection & activation of the "Install Factory" Icon, will change all Adjustments & Installs to the Factory Default!

Help Note: An explanation of each Icon at that menu level will cycle continuously. To exit a display where no Icons are available for selection, pressing any button will exit the display.

These non-selectable Incoms appear in the selected Menu only when there are MORE I cons to the LEFT or to the RIGHT available for selection.

Select and activate to return to the PREVIOUS Menu.

to QUIT, exits & returns to the Attract Mode.

GO TO INSTALLS MENU

After entering **Portals**[™], the **MAIN MENU** now appears. Select the "INST" *Icon* in the **MAIN MENU** with either the **Red** "**LEFT**" or **Green** "**RIGHT**" **Buttons** (the **Flipper Buttons** operates in the same manner) and press the Black "ENTER" Button (the Start Button operates in the same manner). The INSTALLS MENU appears. Continue through this chapter for the explanation & usage of the *lcons* in the INSTALLS MENU.

View Pages 49 & 50 for an Overview of the Standard & Feature Adjustment(s) which have changed upon selection.













To initiate, from the INSTALLS MENU, select the "X.EZ,"

"LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Difficulty is set to EXTRA EASY, "REQUEST INSTALLED" is indicated and returns to the INSTALLS MENU with the previously selected *Icon* flashing.



|Install Directors Cut

To initiate, from the INSTALLS MENU, select the "DCUT" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Type is set to programmers choice. "REQUEST INSTALLED" is indicated and returns to the INSTALLS MENU with the "DCUT" Icon flashing.





Install 3-Ball or 5-Ball

To initiate, from the INSTALLS MENU, select the "3BAL" or "5BAL" lcon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Type is set to 3- or 5-BALL PLAY. "REQUEST INSTALLED" is indicated and returns to the

INSTALLS MENU with the previously selected *Icon* flashing.



📭 🗣 .50 Competition (a.k.a. IFPA)

To initiate, from the INSTALLS MENU, select the "PAY" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Type is set to TOURNAMENT PAY MODE. "REQUEST INSTALLED" is indicated and returns to the INSTALLS MENU with the "PAY" Icon flashing.



📭 Free Play Competition (a.k.a. EXPO or PAPA)

To initiate, from the INSTALLS MENU, select the "FREE" Icon with either the Red "LEFT" or Green FREE "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Type is set to TOURNAMENT FREE MODE. "REQUEST INSTALLED" is indicated and returns to the INSTALLS MENU with the "FREE" Icon flashing.



Install Home Play

To initiate, from the INSTALLS MENU, select the "HOME" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Type is set to NORMAL HOME PLAY. "REQUEST INSTALLED" is indicated and returns to the INSTALLS MENU with the 'HOME" Icon flashing.



Film Star Reset

To initiate, from the INSTALLS MENU, select the "STAR" *Icon* with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Type is set to EASY HOME PLAY. "REQUEST INSTALLED" is indicated and returns to the INSTALLS MENU with the STAR" Icon flashing.



Install Novelty

Note: This setting is recommended where local laws restrict certain game features.

To initiate, from the INSTALLS MENU, select the "NOV" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Type is set to RESTRICTED PLAY. "REQUEST INSTALLED" is indicated and returns to the INSTALLS MENU with the "NOV" Icon flashing.



Install Add-A-Ball Note: This setting is recommended where local laws restrict certain game features.

To initiate, from the INSTALLS MENU, select the "A.A.B" *Icon* with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Game Play Type is set to RESTRICTED "A.A.B" Icon flashing.



Install Factory (ONLY affects all Adjustments/Installs)

To initiate, from the INSTALLS MENU, select the "FACT" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. A All Standard & Feature Adjustments which were changed in the INSTALLS or ADJUSTMENTS MENU are returned to the Factory Defaults.

"REQUEST INSTALLED" is indicated and returns to the INSTALLS MENU with the "FACT" Icon flashing.



Overview of <u>Standard</u> Adjustment Changes upon selection of an Install:



















M m	STANDARD ADJUSTMENT NAME	INSTALL	INSTALL	INSTALL	INSTALL	IN STALL Extra	INSTALL DIRECTORS	INSTALL	INSTALL
N I.	STANDARD ADJUSTMENT NAME	EXTRA Easy	EASY	NORMAL	HARD	HARD	CUT	3-BALL	5-BALL
10	EXTRA BALL PERCENTAGE								
14	BALLS PER GAME							03	05
38	FREEZE TIME					OFF		0:08	AUTO

















Nr.	STANDARD ADJUSTMENT NAME	\$.50 COMPE-	FREE PLAY	INSTALL HOME PLAY	FILM STAR Reset	INSTALL	INSTALL ADD-A- BALL
		TITION *	COMP. *	PLAY	RESET	NOVELTY	BALL
01	REPLAY TYPE					NONE	
03	REPLAY AWARD						EX. BALL
04	REPLAY LEVELS					NONE	
06	SPECIAL AWARD					POINTS	EX. BALL
08	FREE GAME LIMIT					NO FREE	NO FREE
09	EXTRA BALL LIMIT					NO EXTRA	09
10	EXTRA BALL PERCENTAGE			20%	20%		
11	GAME PRICING	USA 3					
13	MATCH PERCENTAGE			10%		OFF	OFF
15	TILT WARNINGS	02	02				
18	GRAND CHAMPION AWARDS					00	00
19	HIGH SCORE #1 AWARDS					00	00
20	HIGH SCORE #2 AWARDS					00	00
21	HIGH SCORE #3 AWARDS					00	00
22	HIGH SCORE #4 AWARDS					00	00
23	GRAND CHAMPION SCORE			25,000,000	25,000,000		
24	DEFAULT HIGH SCORE #1			20,000,000	20,000,000		
25	DEFAULT HIGH SCORE #2			15,000,000	15,000,000		
26	DEFAULT HIGH SCORE #3			10,000,000	10,000,000		
27	DEFAULT HIGH SCORE #4			5,000,000	5,000,000		
30	FREE PLAY	NO	YES	YES	YES		
35	GAME RESTART	NO	NO				
38	FREEZE TIME				0:10		
42	COINDOOR BALL SAVER **	(YES)**	(YES)**				
43	COMPETITION MODE ***	YES ***	YES ***				
		, "		0 ""	.,, .		—

INSTALL
FACTORY
CAUTION!:
Upon selection of
Install Factory
("FACT" Icon), all
Standard & Feature
Adjustments which
were changed in the
INSTALLS or
ADJUSTMENTS
MENU are returned to
the Factory Defaults
(see the Adjustment
Tables on Page 38 for
details).

* If Competition Mode was set, it is suggested to Install Factory to restore all Adjustments to the Factory Defaults. Then recustomize, if desired.

After selection an Install, go back to the Feature Adj. Menu and note the changes:



















Nr.	FEATURE ADJUSTMENT NAME	INSTALL FYTDA	INSTALL	INSTALL NORMAL	INSTALL	INSTALL	INSTALL DIRECTORS	INSTALL	INSTALL
	FEATURE ADJUSTMENT NAME	EXTRA EASY	EASY	(FACTORY)	HARD	EXTRA HARD	CUT	3-BALL	5-BALL
01	BONUS CARRYOVER			NO				NO	
02	POPS LIT GAME START			01				01	
03	EXTRA BALL MEMORY			YES				YES	
04	CAR START POSITION			10				10	
05	GARAGE READY HITS			02				02	
06	FLAGS LIT G.START			02				02	
07	LOCK DIFFICULTY			MODERATE				MODERATE	
08	RACE LTRS GAME START			01				01	
09	RACE LTR ASSIST			YES				YES	
10	SPELL RACE GAME START			02				02	

... Feature Adjustment Menu Install Changes ... continued on the next page.



^{**} Adjustment 42 Default **will not change**; Installing \$.50 **or** Free Play Competition will override this Adjustment regardless of the setting. *** If Adjustment 43 is changed back to **NO** after this Install, the Competition Mode Install will be canceled (turned off).

After selection an Install, go back to the Feature Adj. Menu and note the changes:



















Nr.	FEATURE	INSTALL EXTRA EASY	INSTALL	INSTALL NORMAL (FACTORY)	INSTALL	IN STALL EXTRA HARD	INSTALL DIRECTORS CUT	INSTALL	INSTALL
N r.	FEATURE ADJUSTMENT NAME	EASY	EASY	(FACTORY)	HARD	HARD	CUT	3-BALL	5-BALL
11	HAPPY HOUR GOAL			01				01	
12	INFIELD PARTY GOAL			01				01	
13	SHORT TRACK GOAL			01				01	
14	TEST CAR GOAL			01				01	
15	HAULER RIDE GOAL			01				01	
16	BUMP N RUN GOAL			01				01	
17	RIGHT SIDES GOAL			01				01	
18	SUPERFAN GOAL			01				01	
19	GAS N GO GOAL			01				01	
20	LAPS TO ROAD COURSE			30				30	
21	LAPS TO NEXT ROAD			25				25	
22	SMART BALL SAVER			YES				YES	
23	MODE TIME SECONDS			25				25	
24	MAX BALL SAVERS			1				1	
25	TRACK SAVER			YES				YES	
26	EMPTY LOCKS AT G.O.			YES				YES	
27	DISABLETRACK			NO				NO	
28	SPOT UNLIT SCANNER			YES				YES	

ONLY THE FEATURE
ADJUSTMENTS LISTED
ARE AFFECTED AS NOTED
IN THE TABLES BELOW.









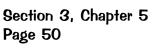






	IN THE TABLES BELOW.	PHY	FREE	HOHE	STAR	NOU	H.H.B	FACT
N	FEATURE ADJUSTMENT NAME	\$.50 COMPE- TITION *	FREE PLAY COMP. *	INSTALL HOME PLAY	FILM STAR Reset	IN STALL Novelty	INSTALL ADD-A- BALL	INSTALL Factory
0	BONUS CARRYOVER							CAUTION! :
02								Upon selection of
0	EXTRA BALL MEMORY							Install Factory
04	07111 0 17111 1 0 0 111 0 11							(<i>"FACT" Icon),</i> all Standard & Feature
0	<u> </u>							Adjustments which
0	. =							were changed in the INSTALLS or
0								ADJUSTMENTS
0	10.10 = 2.110 00 001 001							MENU are returned to
0								the Factory Defaults
10	91 === 11/19= 91/1111= 91/1111							(see the Adjustment Tables on Page 38 for
1	HAPPY HOUR GOAL							details).
12								,
1;								
14	0 . 0 0							
1								
10								
17	11.6.11. 6.2.2.6 6.67.12							
18	001 =: 117 111 0107 12							
19	0.7 to 11 0.0 0.07 t=							
20								
2								
2	• • • • • • • • • • • • • • • • • • •							
2	model initiation of the contract							
2								
2	TRACK SAVER							1

For how to RESET Audits (also can RESET High Scores, Credits or Reset All Adjustments), see Section 3, Chapter 6, GO TO RESET MENU (next page).



EMPTY LOCKS AT G.O.

DISABLE TRACK

26

27

28



Go To Reset Menu

Overview

The Portals[™] Service Menu System provides five (5) functions to reset Coin & Game Audits, High Scores, Credits or to reset ALL AUDITS, ADJUSTMENTS & INSTALLS back to the Factory Default Settings.



Important: The Coin Door must be OPEN allowing the Memory Protect Switch to be disabled, so any Reset changes can be made.



EXPLANATION & USAGE OF COMMON LARGE ICONS USED IN THIS MENU:





to return to the



to QUIT, exits & returns to the

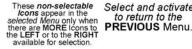
Attract Mode.



Select and activate Select and activate Select and activate to view HELP Screens of the current Menu*.

WARNING: As soon as any Reset Icon is selected & activated, the information associated with the Reset Icon, is lost!

Help Note: An explanation of each Icon at that menu level will cycle continuously. To exit a display where no Icons are available for selection, pressing any button will exit the display.



GO TO RESET MENU

After entering **Portals**[™], the **MAIN MENU** now appears. Select the "RESET" *Icon* in the **MAIN MENU** with either the Red "LEFT" or Green "RIGHT" Buttons (the Flipper Buttons operates in the same manner) and press the Black "ENTER" Button (the Start Button operates in the same manner). The **RESET MENU** appears. Continue below for the explanation & usage of the *Icons* in the **RESET MENU**.



Reset Coin Audits

To initiate, from the **RESET MENU**, select the "COIN" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. A **ONLY** the **Coin Audits (05-13)** will be reset to zero (0), *Factory Default* Settings. "REQ. INSTALLED" is indicated & returns to the RESET MENU with the "COIN" Icon flashing.



Reset Game Audits

Note: Coin Audits (05-13) & Software Meter Audit (14) will not be reset.

To initiate, from the RESET MENU, select the "AUD" Icon with either the Red or Green Buttons and press the Black Button. A ONLY the Game Audits (01-04) & Standard Audits (01-67) will be reset to zero (0), Factory Default Settings. "REQUEST INSTALLED" is indicated and returns to the RESET MENU with the "AUD" Icon flashing.



Reset High Scores

Note: If these five (5) adjustments were not personally changed by you, the Factory Default Settings will be used (see Section 3, Chapter 4, GO TO ADJUSTMENTS MENU, Standard Adjustments 18-22).

To initiate, from the **RESET MENU**, select the "HSTD" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. A **ONLY** the **High Scores** will be reset to the current values. "**REQUEST INSTALLED**" is indicated and returns to the **RESET MENU** with the "HSTD" *Icon* flashing.



Reset Grand Champion

To initiate, from the RESET MENU, select the "GC" Icon with either the Red or Green Buttons and press the Black Button. A ONLY the Grand Champion Score will be reset to the current value. "REQUEST **INSTALLED**" is indicated and returns to the **RESET MENU** with the "GC" *Icon* flashing.



Reset Credits

To initiate, from the RESET MENU, select the "CRED" Icon with either the Red or Green Buttons and press the Black Button. All Credits will be reset to zero (0), Factory Default Settings. "REQUEST **INSTALLED**" is indicated and returns to the **RESET MENU** with the "CRED" *Icon* flashing.



Factory Reset

Note: To **RESET ONLY** the ADJUSTMENTS & INSTALLS (leaving all the Audits alone), see Section 3, Chapter 5, **GO TO INSTALLS MENU**, **Install Factory**.

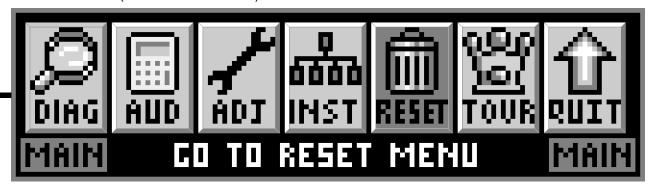
To initiate, from the RESET MENU, select the "FACT" Icon with either the Red or Green Buttons and press the Black Button. All Audits (except for Audit 14, Software Meter), all Adjustments and Installs will be reset to the Factory Default Settings. "REQUEST INSTALLED" is indicated and the Service Menu is exited, returning to the Attract Mode.

Go To Reset Menu

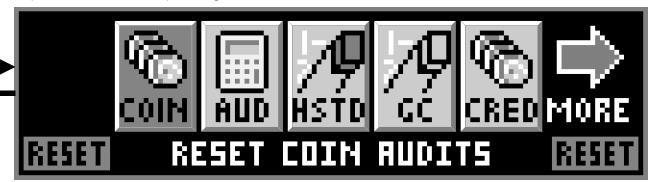


Example:

After entering **Portals**[™], the **MAIN MENU** now appears. Use the **Red "LEFT"** or **Green "RIGHT" Buttons** to select the "RESET" *Icon* (**GO TO RESET MENU**).



Press the **Black "ENTER" Button** to *activate* this **ICON**. The **RESET MENU** now appears with the "COIN" *Icon* (**RESET COIN AUDITS**) flashing:



From the **RESET MENU**, select any of the *Icons* ("COIN", "AUD", "HSTD", "GC", "CRED") with either the **Red** or **Green Buttons** and press the **Black Button** to *activate* the **ICON** chosen. After the **ICON** is selected & *activated*, "REQUEST INSTALLED" is indicated and is returned to the **RESET MENU** with the previously selected *Icon* flashing.

Important:



AT THIS TIME, **DO NOT** PRESS THE **START BUTTON** OR **BLACK BUTTON** AFTER SELECTING ANY OF THE FIVE (5) ICONS UNLESS THIS IS WHAT IS DESIRED. **THE INFORMATION ASSOCIATED WITH THE RESET ICON WILL BE LOST!** PLEASE READ THE PREVIOUS PAGE FOR EXACTLY WHAT WILL HAPPEN IF ANY OF THESE FIVE (5) ICONS ARE **SELECTED & ACTIVATED**.



Before performing any **RESET**, write down your **last Audit Totals** (see Section 3, Chapter 3, **GO TO AUDITS MENU**) and any **personalized Adjustment changes** you may have made (see Section 3, Chapter 4, **GO TO ADJUSTMENTS MENU**).



If the "FACT" *Icon* is select and *activated*, "**REQUEST INSTALLED"** is indicated and the **Service Menu** is exited, returning to the *Attract Mode*. See the previous page for explanation & usage of the Icons in the **RESET MENU**.





Go To Tournament Menu

Overview

The Portals[™] Service Menu System provides 6 Steps necessary to SET-UP, START, MONITOR and END Pinball Tournaments on your *Tournament Pinball System* Ready Pinball Game. OPTIONAL EQUIPMENT & HARÓWARE (SOLD SEPARATELY) ARE REQUIRED FOR PROPER OPERATION AND USE OF THIS MENU.

Game code may get upgraded during production; compare all Tournament Adjustments & Audits in the display with the manual and make any corrections to the Tournament Adjustments and/or Audits Tables (next page), as necessary. Tournament Adjustments & Audits are subject to change (with or without notice). To view Tournament Adjustments & Audits in the display, enter the Portals™ Service Menu System. When any change is made and then the next / previous item is selected (or the Sub-Menu is exited), the display will momentarily flash REQUEST INSTALLED. For details on Earnings, Standard & Feature Audits, see Section 3, Chapter 3, GO TO AUDITS MENU. For details on Standard & Feature Adjustments, see Section 3, Chapter 4, GO TO ADJUSTMENTS MENU.



For more details on the equipment & hardware required, installation and set-up, read the ToPS™Tournament Pinball System Kit Installation Manual (SPI Part Number: 780-6011-01) provided in the Optional

Tournament Kit* (SPI Part Number: 502-5011-00). *Not included with this ToPS™ Ready Pinball Game.

The equipment & hardware consists of:

Electronic 7 X 80 Multi-Color Dot Display (secured above the Backbox), Tournament Serial Interface (TSI) Board (secured in the Backbox), Tournament Button + Lamp (secured onto the Front Molding) and all necessary wiring, hardware and documentation (which also provides suggestions and Tips for ToPS ").

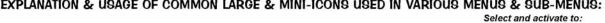
To order, contact your local Distributor (view Pages DR. 🕲 & 🥹 in the Find-It-In-Front: Dr. Pinball). You can also call Technical Support or visit our website (details on the back cover of this manual).



Important: The Coin Door must be OPEN allowing the Memory Protect Switch to be disabled, so any Tournament changes can be made.



EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:





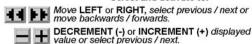












e non-selectable Icons appear in the selected Menu only when there are MORE Icons to the LEFT or to the RIGHT available for selection.

Select and activate to return to the to QUIT, exits & to view HELP PREVIOUS Menu.

returns to the Attract Mode.

Screens of the current Menu*.

* Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.

📭 GO TO TOURNAMENT MENU (OPTIONAL USE ONLY)

After entering **Portals**™, the **MAIN MENU** now appears. Select the "TOUR" *Icon* in the **MAIN MENU** with either the **Red** "**LEFT**" or **Green** "**RIGHT**" **Buttons** (the **Flipper Buttons** operates in the same manner) and press the Black "ENTER" Button (the Start Button operates in the same manner). The TOURNAMENT MENU appears. Continue through this chapter for the explanation & usage of the Icons in the TOURNAMENT MENU.

Tournament Adjustment & Audit Tables on the next page.

Go To Tournament Menu







TOURNAMENT ADJUSTMENT TABLES

TOURNAMENT ADJUSTMENTS 01-15 🛍 = 🦠





Nr.	ADJUSTMENT NAME	USA YOUR Default setting
01	CREDITS PER PLAY	02
02	JACKPOT BASE	\$20.00
03	JACKPOT INCREMENT	\$00.50
04	JACKPOT MAX.	\$2,500.00
05	CURRENT DATE/TIME	JAN. 01, 2004 12:00:00 AM
06	START DATE	FEB. 01, 2004 12:00:00 AM
07	END DATE	MARCH 01, 2004 12:00:00 AM
08	# OF PRIZES	03

Nr.	ADJUSTMENT NAME	U SA D E FA U LT	YOUR SETTING
09	AWARD TYPE	CASH	
10	SHOW PLAYER'S CASH	YES	
11	TOURNAMENT TYPE	BUMP N' WI	N
12	BUMP N' WIN BASE	"varies"	
13	BALLS PER TOURNAMENT	03	
14	BNW DATE SENSITIVE	YES	
15	BNW FIRST PLACE	BUMP	
Note	· Adjustments and/or variables are subject to change (v	with or without notice	2)

Note: The above adjustments must be set just before selecting and activating the "STRT" Icon (START TOURNAMENT). See the following pages for explanation and more details.



ADJ INST RESET TOUR MAIN CO TO TOURNAMENT MENU MAIN

LOCATION MESSAGE





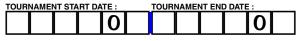
SIGN MESSAGES A-B (ADJUSTMENTS 16-17) 🖾 = ADJUSTMENT NAME

ON

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR Setting
17	PRIZE MESSAGE	ON	

STARTING METER Date (MM/DD/YR) : AUDITOR'S NAME: **CURRENT VOLUME SETTING:** 0 GAME LOCATION NAME: 0 3

See Adj. 06 & 07 above >>









Audit definitions follow in this Chapter.

01	TOTAL PLAYS
02	TOURNAMENT PLAYS
03	TOTAL QUALIFYING PLAYS
04	TOTAL GAME EARNINGS
05	TOTAL TOUR. EARNINGS

06	JACKPOT
07	NET EARNINGS
80	ACCUM. TOTAL PLAYS
09	ACCUM. TOUR. PLAYS
10	ACCUM. QUALIFYING PLAYS

11	ACCUM. EARNINGS
12	ACCUM. TOUR EARNINGS
13	ACCUM. JACKPOT
14	# TOURNAMENTS

Section 3, Chapter 7 Page 54



Go To Tournament Menu

Tournament Adjustments (01-15) 🖽 🖼

To initiate, from the TOURNAMENT MENU, select the "SET UP" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. Select and activate either of the ">>" Mini-Icons to view the next or previous Tournament Adjustment in this group. Select and activate either of the "-" or "+" Mini-Icons to change the setting, if desired (the Default Setting is noted in the definitions below). The display will describe the Tournament Adjustment Number, Tournament Adjustment Name and the Current Tournament Adjustment Setting. The current Tournament Adjustment will remain in the display until the next Tournament Adjustment is viewed or when this Menu is exited.

Note on Tournament Adjustments 5, 6 & 7: *Requires the TIMEKEEPER™ IC (included in the kit) installed in Location U212 on the CPU/Snd. Board. How to change the CURRENT DATE/TIME, START DATE & END DATE: Upon entering the menu, the ">>" Mini-Icon and the Month is flashing. Use the "+" or "-" Mini-Icon to change the month. Select the ">>" Mini-Icon again, now the day can be changed. Continue this until all is set to your liking. After the CURRENT DATE/TIME (T. Adj. 05) and the START & END DATE/TIME (T. Adj. 06/07) are set, the "STRT" Icon must be activated, in order for the Tournament to start and end automatically. In the event you have to End a Tournament before your designated date/time or you do not have the TIMEKEEPER™ IC installed go back to the TOURNAMENT MENU and select the "END" Icon (see the next page) to stop the Tournament.

IMPORTANT FOR TOURNAMENT USERS: Select the settings carefully. Before allowing players to begin after you've started a Tournament, double-check the Normal Mono-Color Dot Display and Top Multi-Color Dot (Beta Brite®) Display to ensure everything you want is displayed correctly. Once a Tournament is started, no adjustments can be made until you end the Tournament (by selecting the "END" Icon). Allowing players to qualify, then ending a Tournament prematurely to make corrections will affect the outcome of the Tournament.

NING: Changes made in any Adjustments will be lost after a FACTORY RESET or removal of the CPU/Sound Board **TOURNAMENT ADJUSTMENT NAME: Definition** Nr. CREDITS PER PLAY: Set between 01 - 10. Default is 02. Set the maximum number of Credits that may 01 be accumulated per game. JACKPOT BASE: Set between \$00.00 - \$999,999.00 (increments of \$1). Default is \$20.00. Set the initial 02 Prize Pool Amount to be offered for the Tournament. Note: The displays will present the words "PRIZE **POOL**" in lieu of the word "JACKPOT". **JACKPOT INCREMENT:** Set between \$00.00 - \$999,999.99 (increments of 1¢). Default is \$00.50. Set 03

- the Prize Pool Increment which will increase the Prize Pool Amount with each Tournament Game played. **JACKPOT MAX.:** Set between \$00.00 - \$999,999.00 (increments of \$1). Default is \$2,500.00. Set the 04
- maximum cap to be placed on the Prize Pool during a Tournament. Note: The displays will present the words "PRIZE POOL" in lieu of "JACKPOT"
- CURRENT DATE/TIME: Set the current MONTH, DAY, YEAR, HOUR (AM/PM), MINUTE and SECOND. 05 Default is JAN. 01, 2004 12:00:00 AM.
- START DATE: Set the desired MONTH, DAY, YEAR, HOUR (AM/PM), MINUTE and SECOND. Default is 06 FEB. 01, 2004 12:00:00 AM.
- END DATE: Set the desired MONTH, DAY, YEAR, HOUR (AM/PM), MINUTE and SECOND. Default is 07 MARCH 01, 2004 12:00:00 AM.
 - # OF PRIZES: Set between 01 05 (If Tournament Adj. 11 is set to REGULAR) or 02 05 (If Tournament Adj. 11 is set to BUMP N' WIN). Default (for either) is **04**. Set the max. number of *Prize Positions* to be awarded during a Tournament. **Selections are as follows** (percentage distribution cannot be changed):

```
If below Tournament Adj. 11 is set to REGULAR:
                                                                                      If Trn. Adj. 11 is set to BUMP N'WIN (Default):
   Set to 01 1 Winner 100% (1) Prize Pool
                                                                                     Cannot set to 01. Minimum of 2 winners required.
   Set to 02 2 Winners 65% (1) 35% (2)
Set to 03 3 Winners 50% (1) 35% (2)
Set to 04 4 Winners 50% (1) 25% (2) 15% (3) 10% (4)
Set to 05 5 Winners 50% (1) 20% (2) 15% (3) 10% (4) 5% (5)
Set to 05 5 Winners 50% (1) 20% (2) 15% (3) 15% (4) 15% (5)
```

AWARD TYPE: Set to CASH, POINTS, TICKET, NONE or PRIZE. Default is CASH. Select CASH for the displays to represent the Prize Pool amount (based on Jackpot Base and Max.) in \$Dollars. Select POINTS for the displays to represent the Prize Pool amount in **Points**. Select **TICKET** for the display to represent the 09 Prize Pool amount in *Tickets*. Select **NONE** NOT TO represent the Prize Pool amount (if prize(s) to be awarded are not Cash, Points or Tickets). Select PRIZE, if applicable.

Above T-Adj. 9 determines how the Prize Pool is to be represented in the Attract Mode on both the Normal & top Beta-Brite® Displays

- SHOW PLAYER'S CASH: Set to YES or NO. Default is YES. When set to YES, the >>> previous <<< 10 Tournament Winners & Cash amount will show in the **Attract Mode** on both Dot Displays.
- TOURNAMENT TYPE: Set to REGULAR or BUMP N'WIN. Default is BUMP N'WIN.
- BUMP N' WIN BASE: Set between X,000,000 XX,000,000 (increments of 1M). Default is *varies*. Set the desired Bump N' Win Tournament base score. Tournament Adj. 11 must be set to BUMP N' WIN.
- BALLS PER TOURNAMENT: This adjustment only affects TOURNAMENT GAMES. Set between 02 09. 13 Default is 03. Set the max. number of balls per game.
- BNW DATE SENSITIVE: Set to YES or NO. Default is YES. When set to YES, the scores/criterion selected 14 are influenced by the Tournament End Date selected.
- BNW FIRST PLACE: Set to BUMP or REPLACE. Default is BUMP. When set to BUMP, the 1st place player is bumped to 2nd (and in-turn bumps remaining leaders down 1). When set to REPLACE, the 1st place 15 player is replaced by the new 1st place player (the other board leaders are therefore not bumped down).



Go To



Start Tournament (select only after Set-Up is completed)

To initiate, from the **TOURNAMENT MENU**, select the "STRT" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER"**

Button. The "START TOURNAMENT?" MENU appears with the "NO" Mini-Icon flashing. If Set-Up (Tournament

the "NO" Mini-Icon flashing. If **Set-Up** (Tournament Adjustments) was not completed **OR** the **Tournament Audits** were not recorded from the prior Tournament, exit this Menu



by activating the "NO" *Mini-Icon*. If **Set-Up** was completed and the **Tournament Audits** were recorded, select and activate the "YES" *Mini-Icon*. The Pinball Game is set to **Tournament Ready Mode** (the **Flashing Tournament Button** must be depressed for a Tournament Game after the proper credit is inserted). "**REQUEST INSTALLED**" is indicated and returns to the **TOURNAMENT MENU** with the "STRT" *Icon* flashing. **Note:** If the "STRT" Icon appears to be non-functioning, it is because a Tournament is in progress. The Tournament must first be stopped (select and activate the "END" Icon in the **TOURNAMENT MENU**).

Stop Tournament (select if no TIMEKEEPER is installed*)

* If Timekeeper is NOT installed or you have to end the Tournament prematurely, use this Icon to end it. To initiate, from the TOURNAMENT MENU, select the "END" Icon with either the Red "LEFT" or Green "RIGHT" Buttons and press the Black "ENTER" Button. The "END TOURNAMENT?" MENU appears with the "NO" Mini-Icon

flashing. If the *Tournament* was not completed, exit this Menu

END TOURNAMENT?

MO YES QUIT ?

by activating the "NO" Mini-Icon. If the **Tournament** was completed (the End Date set has passed), select and activate the "YES" Mini-Icon. The Pinball Game is taken out of **Tournament Ready Mode** (to readjust any Tournament Adjustments, the Tournament must be "stopped"). "REQUEST INSTALLED" is indicated and returns to the **TOURNAMENT MENU** with the "END" Icon flashing. Record your Tournament Audits at this time as they will be reset (except for the "Accumulative Audits) if another Tournament is started!

Tournament Prizes

To initiate, from the **TOURNAMENT MENU**, select the "PRIZ" *Icon* with either the **Red "LEFT"** or **Green** "**RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Leader in this group. The display will describe the **Leader**and Ard Ath 8 5th) Leader Name 4 Digit Rip Code, and Brize Real particle for the Current

Placement (1st, 2nd, 3rd, 4th & 5th), Leader Name, 4-Digit Pin-Code, and Prize Pool portion for the Current and Previous Tournaments. The current Leader (and related information) will remain in the display until the next Leader is chosen or when the Sub-Menu is exited.

Tournament Audits (01-14) 🕕 🖼

To initiate, from the **TOURNAMENT MENU**, select the "AUD" *Icon* with either the **Red** "**LEFT**" or **Green** "**RIGHT**" **Buttons** and press the **Black** "**ENTER**" **Button**. Select and *activate* either of the ">>" *Minilons* to view the next or previous Tournament Audit in this group. The display will describe the **Tournament Audit Number**, **Tournament Audit Name** and the **Current Tournament Audit Total** (Value). The current Tournament Audit will remain in the display until the next Tournament Audit is viewed or when this Menu is exited.

IMPORTANT FOR TOURNAMENT USERS: >>>> A L L of the Tournament Audits 01-14 are RESET O N L Y if a Factory Reset is done (see Section 3, Chapter 6, GO TO RESET MENU). >>>> Tournament Audits 01-07 are RESET ONLY if a new Tournament is started. >>>> Tournament Audits 07-14 are NOT RESET*, they're accumulative (totals accumulate since the first Tournament was played). *if no Factory Reset is done.

Nr. TOURNAMENT AUDIT NAME: Definition

- **TOTAL PLAYS:** Provides the total number of *Regular* and *Tournament Games* played while a *Tournament is active (in progress)*. This total is derived by adding the below Tournament Audit 02 with *Regular Plays*.
- **TOURNAMENT PLAYS:** Provides the total number of *Tournament Games* played while a *Tournament is active (in progress).*
- **TOTAL QUALIFYING PLAYS:** Provides the total number of times a player qualified (invited to enter name).
- **TOTAL GAME EARNINGS:** Provides the total Gross Earnings *accepted,* while a *Tournament is active (in progress).*
- **TOTAL TOUR. EARNINGS:** Provides the total Tournament Earnings (Audit **04** less Regular Game Earnings) while a Tournament is active (in progress).
- **JACKPOT (PRIZE POOL TOTAL):** Provides the total Prize Pool (*Jackpot*) Amount to be paid out while a *Tournament is active (in progress).*

Tournament Audits 07-14 continued on the next page.





TOURNAMENT AUDIT NAME: Definition

The following Tournament Audits WILL NOT BE RESET if a new Tournament is started. ALL AUDITS can be reset if a Factory Reset is done!

- **NET EARNINGS:** Provides the total Net Earnings (Gross Earnings less Prize Pool) while a Tournament is active (in progress).
- **ACCUM. TOTAL PLAYS:** Provides the accumulative total amount of *Regular & Tournament Games* played since the first Tournament was played.
- **ACCUM. TOUR. PLAYS:** Provides the accumulative total amount of *Tournament Games* played since the first Tournament was played.
- 10 ACCUM. QUALIFYING PLAYS: Provides the accumulative total number of times a player qualified (invited to enter name).
- 11 ACCUM. EARNINGS: Provides the total Gross Earnings accepted, since the first Tournament was played.
- **ACCUM. TOUR EARNINGS:** Provides the accumulative total Tournament Game Earnings since the first Tournament was played.
- **ACCUM. JACKPOT :** Provides the accumulative total of Prize Pool *(Jackpot)* Amounts paid out since the first Tournament was played.
- **# TOURNAMENTS :** Provides the number of Tournaments (not individual Tournament Games) since the first Tournament was played.

Sign Messages A-B (Tournie Adj. 16-17) 11 11 11

To initiate, from the **TOURNAMENT MENU**, select the "A-B TEXT" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Tournament Adjustment in this group. Select and *activate* either of the "-" or "+" *Mini-Icons* to change the setting, if desired *(the Default Setting is noted in the definitions below)*. The display will describe the **Tournament Adjustment Number**, **Tournament Adjustment Name** and the **Current Tournament Adjustment Setting**. The current Tournament Adjustment will remain in the display until the next Tournament Adjustment is viewed or when this Menu is exited.

Nr. TOURNAMENT ADJUSTMENT NAME: Definition

LOCATION MESSAGE: Set to ON, CHANGE or OFF. Default is ON. When set to CHANGE, a new message can be set or the old one can be edited (select the "+" Mini-Icon to change settings until "CHANGE" appears in the display, then select the ">>" Mini-Icon to access.). At the top left corner of the Display, the letter A is indicated (blinking) in the first available position. Vary the letter(s) by operating the Left and Right Flipper Buttons (or "RED" or "GREEN" Buttons). With the desired letter indicated, depress the Start Button to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space

until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the "BLACK" Button, "REQUEST INSTALLED" is indicated and then exits this sub-menu.

17 PRIZE MESSAGE: Set to ON, CHANGE or OFF. Default is ON. Procedure identical to Tournament Adjustment 16, Location Message.

The **DEFAULT LOCATION MESSAGE** is:

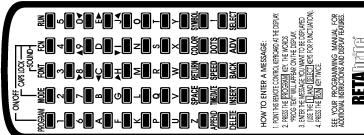
STERN PINBALL PROUDLY PRESENTS...

The **DEFAULT PRIZE MESSAGE** is:

YOU CAN BE THE NEXT BIG WINNER!











Which Switch is Which? Switch between chapters ...

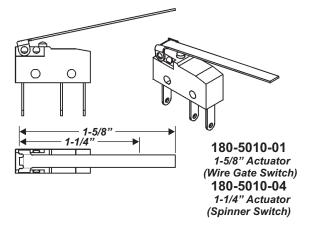
Identifying switches. Find your switch in the **Pink** or **Blue Pages**. For playfield switch location, see Pages **66-67**. These pages identify the type, quantity used, location and switch matrix number. You can also find your switch on the assembly itself, by looking in **Chapter 2**, **Drawings for Major Assemblies & Ramps**; see Page **81** to locate your assembly and page number.

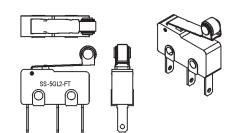
• 180-5200-00 For views, see Page 82 • 180-5116-01 For views, see Pages 84-85 • 180-5178-00

• 180-5178-00 • 180-5179-00

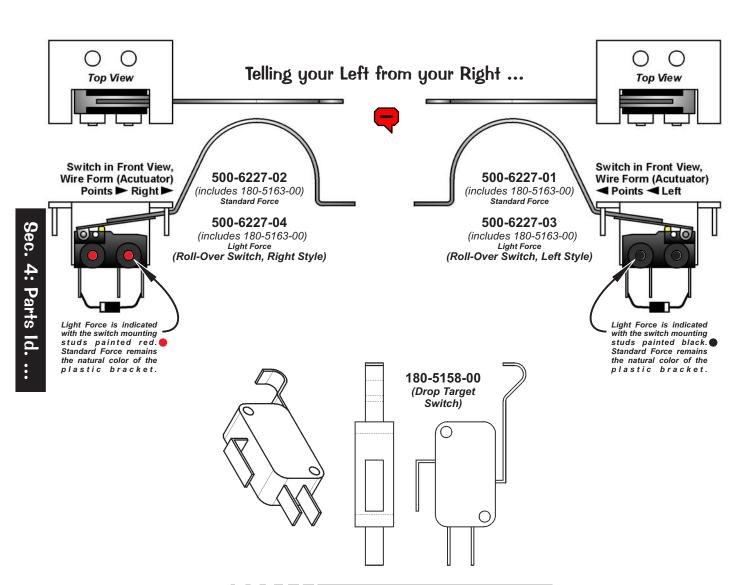
For views, see Page 91
• 180-5057-00

For views, see Page 100





180-5119-02 Roller Actuator (Ball Trough Switch and Special Applications) SS-5GL2-FT



Section 4, Chapter 1 Page 58



Parts Identification & Location

Parts Identification & Location (The Pink Pages)

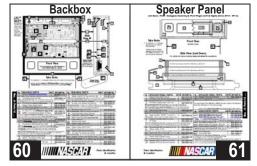
View Drawings for Major Assemblies & Ramps, in Section 4, Chapter 2 of 2 (Blue Pages), Pages 81-104.



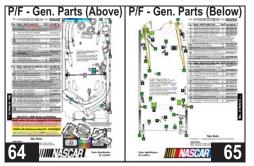
Table of Contents & Overview

This section provides the part number and locations of most of the components in this Pinball Machine. These parts are arranged in 3 groups: BACKBOX, CABINET & PLAYFIELD Note Pages 70-80: All Posts, Nuts, Spacers, Rubber Parts, Sockets and Bulbs shown are drawn Actual Size. If no quantity is shown, that item is not used on this game (however, quantities and/or parts may change during production with or without notice).

Optional Kits available through your Distributor:
Pinball Location Maintenance Standard & Deluxe Kits!
See Pages 63 or 64 for Part Number & more info!

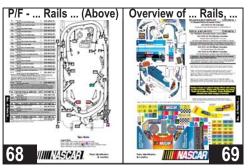


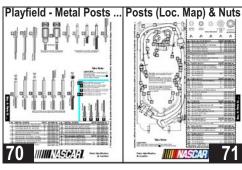


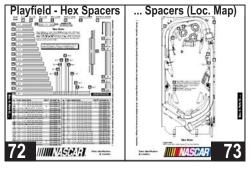


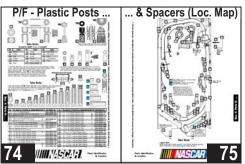






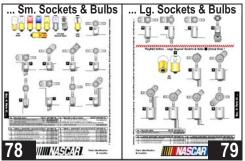


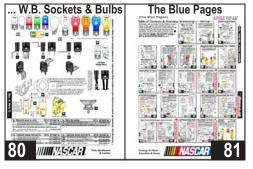


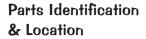






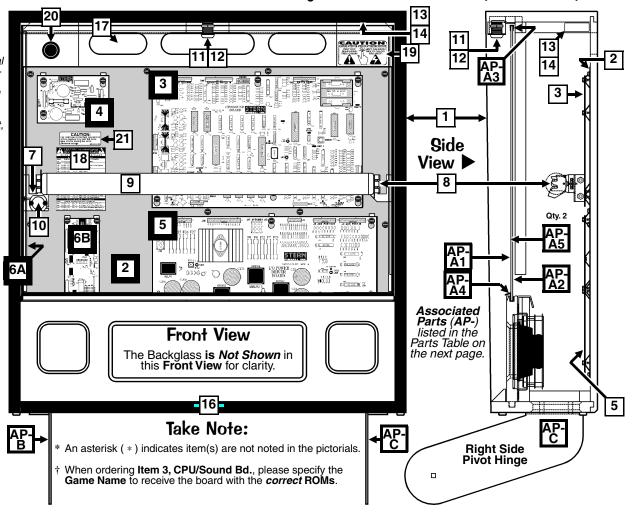








‡ Item 20, Button Hole Plug (Black) is the optional ToPS™ Access Hole: if removing for the Optional ToPS™ Kit, save with the game.

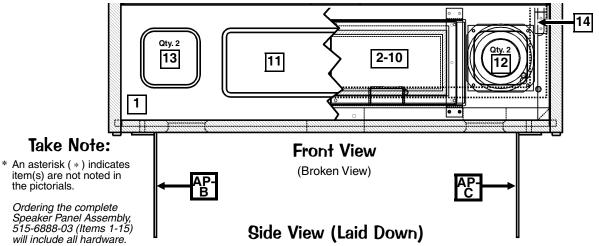


	Nr.	BACKBOX PARTS	QTY.	SPI PART Nr.
	1	Backbox NASCAR® Screened No Parts	. 1	525-5631-17-86
	Item 1	Note: Chrome T-Molding is installed and cannot be or	rdered se	eparately.
	2	PCB Metal Mounting Plate	1	535-5809-14
		is secured to Item 1 by: #8 X 1/2" SHWH AB (Zinc) isher 7/32" I.D. X .5" O.D. X 1/16" Thick (Qty. 4) (242-50		(234-5101-00) and
	3 †	CPU/Snd. Bd. w/ATMEL Sound Processor	1	520-5300-00
	4	Display Power Supply Board	1	520-5138-00
	5	I/O Power Driver Board Rev. G or higher	1	520-5137-01
	Items 3	s, 4 & 5 are secured to Item 2 by: #8-32 X 3/8" HWH	I MS (Qty	v. 19) (237-5903-00)
	6A	3X Trans. Drvr. Bd. (UK/Special Apps.)	Only)	520-5068-01
	6B	ToPS TM Tournament Serial Interface (TSI) Box	ard	520-5220-00
	optio	nal Item 6A is required for UK Games to support	Auxiliary	assemblies listed
	Dispen	he Coil Matrix of Q1-Q32; also used for Special Appli sers used in conjunction with **optional** Item 6B To	cations : PS™ TSI	such as Ticket / Coin Board.
7	7	Fluorescent Light Bracket Assy. Left	1	515-6545-00
		bly <u>Parts Included</u> : Fluorescent Light Bracket Left (9-00), Lamp Holder**
	8	Fluorescent Light Bracket Assy. Right	1	515-6545-01
		bly Parts Included: Fluorescent Light Bracket Right		39-01), Lamp Holder**
		ocking) (077-5214-00) and Starter Base <i>(with Leads)</i> * ured by: #6-32 X 5/8" PPH MS (Sems) Zinc (Qty. 1) (
		eured by: #4-40 X 1/2" PPH MS (Sems) Zinc (Qty. 2) (
		7 & 8 are secured to Item 1 by: #10-24 X 1-1/4" Carr 012-00), #10-24 Keps Nut (Qty. 2/per) (240-5207-00) a		
		ng Tape (Qty. 1, Sold in 12" Lengths only) (626-5040-0		Co nellilorded
	9	Fluorescent Tube 24" (F20T9CW)	1	165-5061-00
	10	Starter - Fluorescent (FS2 Light)	1	165-5011-01
	11	Lock Mounting Plate	1	535-8128-01

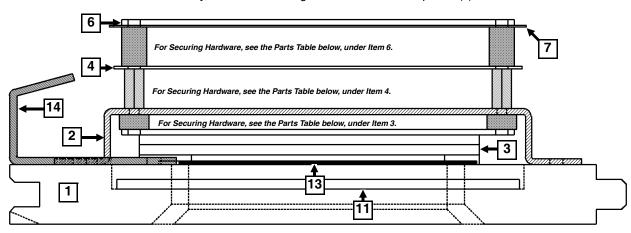
Nr.	BACKBOX PARTS	QTY.	SPI PART Nr.	Nr.	BACKBOX PARTS	QTY.	SPI PART Nr.
1	Backbox NASCAR® Screened No Parts	1	525-5631-17-86	13	Ballast Mounting Plate	1	535-8657-00
Item 1	Note: Chrome T-Molding is installed and cannot be of	ordered s	eparately.	14	Ballast CU45Z-W 1/2" Core 120v 60 Hz 13W	1	010-5015-00
2 Item 2	PCB Metal Mounting Plate is secured to Item 1 by: #8 X 1/2" SHWH AB (Zinc)	1 (Oty 13)	535-5809-14		13 & 14 are secured to Item 1 by: #6 X 5/8" SHWH K Only Ordering Note: Ballast, 5/8" Core 50/60 Hz (
	asher 7/32" I.D. X .5" O.D. X 1/16" Thick (Qty. 4) (242-5		(20 : 0 : 0 : 00) and	15*	#1 Roto Lock Male (on Cabinet)	1	355-5006-01
3 †	CPU/Snd. Bd. w/ATMEL Sound Processor	1	520-5300-00	16	#1 Roto Lock Female (R2-0002-02)	1	355-5006-02
4	Display Power Supply Board	1	520-5138-00		6 is secured by: #10-24 X 1-3/4" CBSN (231-5022-0		
5	I/O Power Driver Board Rev. G or higher	1	520-5137-01		207-00), #10-24 X 2" CBSN (231-5045-00), #10-24 Ko asher 7/32" ID X .5" OD X 1/16" (Qty. 5) (242-5003-00		240-5207-00) and
Items 3	3, 4 & 5 are secured to Item 2 by: #8-32 X 3/8" HWI		y. 19) (237-5903-00)	17	Back Vent Grill 2-1/2" X 18"	1	545-5072-02
6A	3X Trans. Drvr. Bd. (UK/Special Apps.	• ,	520-5068-01		7 is secured by: Staple 5/16" (Qty. 23) (631-5000-00		0 10 0072 02
6B	ToPS TM Tournament Serial Interface (TSI) Bo		520-5220-00	18	Fuse Description Decal (Generic)	1	820-6152-02
	nal** Item 6A is required for UK Games to support he Coil Matrix of Q1-Q32; also used for Special Appl			19	"CAUTION - VERY HOT" Decal	1	820-6266-00
Dispen	sers used in conjunction with **optional** Item 6B To	PS™ TS	Board.	20‡	Button Hole Plug (Blk) (Happ #52-6214-00)	1	500-6566-00
7	Fluorescent Light Bracket Assy. Left	1	515-6545-00	21	Fuse Label (UL)	1	820-6143-00
	hbly <u>Parts Included</u> : Fluorescent Light Bracket Left pocking) (077-5214-00) and Starter Base (with Leads):			22*	Backbox Date Label	1	820-5091-00
8	Fluorescent Light Bracket Assy. Right	1	515-6545-01	23*	Ribbon Cable, 20-Pin (4")	1	036-5000-04
_	ably Parts Included: Fluorescent Light Bracket Righ			Item 2	3 (20-Pin) connects the CPU/Sound Board to the I/C	Power D	river Board.
	ocking) (077-5214-00) and Starter Base <i>(with Leads)</i> : ured by: #6-32 X 5/8" PPH MS (Sems) Zinc (Qty. 1)			24*	Ribbon Cable, 26-Pin (40")	1	036-5001-40
	cured by: #6-32 X 3/6 FFH MS (Sems) Zinc (Qty. 1) (cured by: #4-40 X 1/2" PPH MS (Sems) Zinc (Qty. 2)				4 (26-Pin) connects the CPU/Sound Board to the Dis	splay Con	
	7 & 8 are secured to Item 1 by: #10-24 X 1-1/4" Car			25*	Display Cable (Wiring Harness)	1	036-5454-00
	012-00), #10-24 Keps Nut (Qty. 2/per) (240-5207-00) a ng Tape (Qty. 1, Sold in 12" Lengths only) (626-5040-		X 3" Reinforced	26*	Zip Cable Tie (Screw Down Style)	3	040-5005-00
9	Fluorescent Tube 24" (F20T9CW)	1	165-5061-00		6 is secured by: #8 X 7/8" PPH AB (Zinc) (Qty. 1/per	, ,	,
10	Starter - Fluorescent (FS2 Light)	1	165-5011-01		Clamps: 1/4" (Dbl.) 1/2", 3/4" & 1" (Sng.) 26-27 are secured by: #8 X 1/2" SHWH AB (Zc.) (Qt	11	040-5000-XX
11	Lock Mounting Plate	1	535-8128-01		ith: 1/4" use -23 (Qty. 2); 1/2" use -06 (Qty. 1); 3/4" use		
12	Lock 5/8" Barrel, 3/4"ø, 1.5" Flat Cam	1	355-5055-00	29*	Ground Strap (5") (by Item 12)	1	600-5006-05
	11-12 are secured by: #8 X 5/8" TP Torx T20 (Qty. 4)	(237-59		30*	Braided Wire (1.5')	1	600-5001-00

Not sold as an assembly, order the individual part(s) actually required.

NASCAR® Pinball Speaker Panel Assy. for the Backbox, 515-6888-03-86 (Items 1-14) and Assoc. Parts: Backglass Assembly & Pivot Hinges (Left & Right) (Items AP-A - AP-C)



For clarity, the below drawing *does not show* the speaker(s).



Nr.	SPEAKER PANEL PARTS	QTY.	SPI PART Nr.	Nr. SPEAKER PANEL PARTS QTY. SPI PART Nr.
1	Speaker Panel (Black Wood)	1	525-5515-00	14 Speaker Panel Hook Bracket 2 535-7009-02
2	Dot Matrix Disp. Bd. Mounting Bracket	2	535-8368-01	Items 12, 13 & 14 are secured by: #8 X 5/8" SHWH AB (Green) (Item 12: (Qty. 4/per); Item 13: (Qty. 4/per); Item 14: (Qty. 2/per) (234-5102-04)
Item 2	is secured to Item 1 by: #8 X 5/8" SHWH AB (Green)) (Qty. 4/	oer) (234-5102-04)	16.11 16. (Gty1/por), Refit 14. (Gty. 2/per) (204-3102-04)
3	Dot Matrix Display Board 128 X 32	1	520-5052-00	The Associated Parts AP-A thru AP-C are also noted in the Backbox
	is secured to Item 2 by (at corners): 3/16" X 3/8" Sp 000-18) and #6-32 X 1/2" SHWH Swage (Serr) Zinc (C			Assembly drawings on the previous page.
Ìtem 3	is secured to Item 4 (at the top center) by: 3/4" X 1/- 0 (254-5008-04) and #6-32 X 1/4" PPH MS (Sems) Zind	/4" Héx S	spacer #6-32 Tap	40000 DIDTO 405 NO. 105 NO. 10
` , ,		u (QIY. I)	`	ASSOC. PARTS ARE NOT INCLUDED WITH BACKBOX/SPKR. PANEL ASSY'S.
4 Item 4	Static Shield (Steel Plate) is secured to Item 2 by: 1/2" X 1/4" Hex Spacer #6-3] 32 Tan (O	535-6437-00 btv 4) (254-5008-03)	Nr. ASSOCIATED PARTS QTY. SPI PART Nr.
and #6	6-32 X 1/2" PPH MS (Sems) Zinc (Qty. 2, on Left Side of	only) (232	2-5202-00)	AP-A1 Clear Backglass 25.906" X 19.187" 1 660-5038-02
5*	Edge Protector - SPGS-1 (on Item 4)	1	545-5592-02	AP-A2 NASCAR® (MillerLite) Film Art* 1 515-7252-00-86
Orderi	ing Note: "Item 5" is sold in 12" length. Required: .67	Ft.		optional NASCAR® (RustyLogo) Film Art * 1 515-7252-01-86
6	Display Controller Board FCC-FEB98	1	520-5055-03	* Note: The NASCAR® Backglass Film Art must have the Official
7	RF Shield	_1	820-5092-00	NASCAR Hologram Logo affixed. It cannot be displayed without it!
	6 & 7 are secured to Item 4 by: 1/2" X 5/16" X .144 ID X 3/4" PPH MS (Sems) Zinc (Qty. 3) (237-5504-00), 1/2			AP-A3 Top Plastic Channel - 26" 1 545-5018-15 AP-A4 Bottom Plastic Lift Channel - 26-1/16" 1 545-5021-01
) (254-5008-03) and #6-32 X 1/4" PPH MS (Sems) Zinc			1 040 0021 01
8*	Ground Strap (25") (on Items 4, 6, 12)	4	600-5006-25	AP-A5 Plastic Edging (Left/Right) - 18-1/8" 2 545-5018-14 Items AP-A3, -A4 & -A5 are secured to AP-A1 by: Taple (Double-Sided), 12" (Qty. 1)
9*	Ribbon Cable, 14-Pin	1	036-5260-00	(626-5005-00) Note: Only 6" required, sold in 12" lengths only.
Item 9	Note: The 14-Pin cable connects the Dot Matrix Disp.	Bd. to the	e Disp. Controller Bd.	AP-B Pivot Hinge Left 1 535-7999-00
10*	Foam 3/16" Thk. X 1/4" X 36"	6	626-5026-00	AP-C Pivot Hinge Right 1 535-7999-01
	e Item 10 is self-adhesive. Located behind Item 3. So	old in 12"	Lengths only.	Items AP-B & AP-C are secured to Backbox by: 1/4"-20 X 1-1/4" C.B. Sq. Neck (Qty. 4)
.11	Plastic Shield (Display Cover)	1	545-5884-00	(231-5003-00), 1/4"-20 Flange Nut (Qty. 4) (240-5300-00) and Fend Washer 1/4" I.D. X 1" O.D. (Qty. 1) (242-5009-00)
	1 is secured to Item 2 by: #6 X 3/8" SHWH AB (Zinc)	, , ,	, ,	Items AP-B & AP-C are secured to Cabinet by: Spacer Hex Nut 1/2" O.D 1/4-20 X 1/2"
12	Speaker (Shld.) 4" 8Ω MG Elec #4060SH	2	031-5004-01	TD (Black) (Qty. 1/per) (254-5042-00), Nylon Spacer (Black) (Qty. 1/per) (242-5084-00), 1/4-20 X 1/2" Carriage Bolt Sq. Neck (Black) (Qty. 1/per) (231-5072-00), Fend Washer 1/4"
13	Speaker Grill (Chrome w/no Artwork)	2	535-8081- <mark>04</mark>	I.D. X 1" O.D. (Qty. 1/per) (242-5009-00) and 1/4"-20 Flange Nut (Qty. 1/per) (240-5300-00)



19R

I = 16 Qty. 2 31 13 View of the back of the Cabinet with the Backbox in the down position

26 Qty. 2

32C

20

Take Note:

An asterisk (*) indicates item(s) are not noted in the pictorials.

Legend Note: Items noted with a black square are Cabinet Parts. Items noted with a white square are Switches.

500-6146-00-04N FOR A BREAKDOWN OF PARTS SEE: Sec. 4, Chp. 2, Drawings for ... Assemblies

Flipper Button (Red) Assembly 6 2 500-5026-32 Item 6 is secured by: Pal Nut for Flipper Button (Metal) (Qty. 2/per) (240-5003-01) and is fitted with: O-Ring 11/32" X 7/32" X 1/16" (Qty. 1/per) (545-5850-00) Item 6 DOES NOT include the Switch Asm. FOR SWITCH ONLY see Item 23 on the Next Page.

Rear Glass Channel 20-3/8" Length 545-5038-00 Plastic Channel 42-5/8" Lg. (Left/Rt.) 8 545-5017-00 Side Armor (Left) with Button Guard 9L 535-9596-00 Side Armor (Right) with Button Guard 535-9596-01 Items 9L & 9R are secured @ front & side by: Pem Stud 1/4 X 1" Flange Head Black (Qty. 1/per) (237-6116-01), 1/4-20 Flange Nut (Qty. 1/per) (240-5300-00) and #8 X 5/8" T20 Tamper Proof Black (Qty. 5/per) (237-5947-00); @ rear (backbox) by: #10-24 X 1" Sq. Neck Carrg. Bolt Black (Qty. 1/per) (231-5021-00) and #10-24 Hex Nut (Qty. 1/per) (240-5202-00)

CAB. PARTS & SWITCHES QTY. SPI PART Nr. Front Molding (Black) Sq. Button Hole 500-6882-00-00 Item 10 requires: Self-Adhesive Foam Rubber 3/8" X 3/16" X 20-3/8" (3 Ft.) (626-5001-00).

Ordering Note: Can only be used in conjunction with new Lockdown Asm. 500-6881-00 (Item 21)

Button Square Hole Plug (Black) 500-6883-00 P/F Glass (Tmprd.) 21" X 43" X 3/16" 660-5001-00 Hex Key Allen Wrench 5/16" 777-0001-00 13 Corrugated Tubing Black 1"ø X 2.6' Lg. 605-5008-03

Above Item 14 covers the Cables Wiring Harnesses going into the Backbox from the Cab. #1 Roto Lock Male (R2-0055-02) 355-5006-01

Item 15 is secured by: #10-24 X 1-3/4" Carr. Bolt Sq. Neck (Qty. 2) (231-5022-00), #10-24 N.S. Nut (Qty. 2) (240-5206-00) and #10 Washer 7/32" X .5" X 1/16" (Qty. 2) (242-5003-00) #1 Roto Lock Female (on Backbox) 355-5006-02 16

Coin Door (with Validator) USA only 500-5018-172 Item 17 is secured by: 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 4) (231-5003-00) 1/4"-20 Flange Nut (Qty. 4) (240-5300-00) and Fend Washer 1/4" I.D. X 1" O.D. (Qty. 3) (242-5009-00) Note: For Coin Door other than USA call Technical Support for SPI Part Nr.

Coin Door Sw. (USA) (Happ Control) 2 180-5024**-01** 18 ALT. SWITCHES 18: Coin Door Switch (USA) (Coin Control) (180-5024-00) 18J: Coin Door Switch (¥ Japan) (180-5091-00)

Bracket for below PortalsTM Switches 19B: Push-Button Portals™ Switch (Black) (180-5192-00) 19R: Push-Button Portals™ Switch (Red) (180-5192-02) 19G: Push-Button Portals™ Switch (Green) (180-5192-04) **SWITCHES** 19 Ordering Note: Securing hardware for switches included. For Decal Kit, see Page 69.

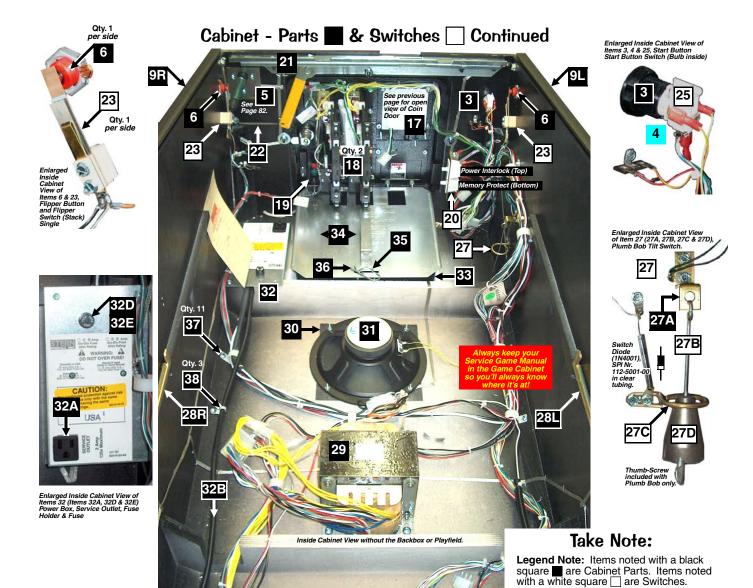
Parts Table & Views continue on the next page.

11/4

QTY. SPI PART Nr.

031-5007-00

515-5360-07



Nr.

31

QTY. CAB. PARTS & SWITCHES SPI PART Nr. Parts Table & Views continue on the previous page Power Interlock-Memory Protect Switch Asm. 500-5808-00 Assembly Parts Included: Mounting Bracket (535-6958-00), Power Interlock (Playfield) Switch (TOP) (180-5136-00) and Memory Protect Switch (BOTTOM) (180-5000-01) Item 20 is secured to Cabinet by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2) (234-5101-00) Front Molding Lockdown Asm. 500-6881-00 Item 21 is secured by: #10-24 X 1-1/4" Carr. Bolt (Qty. 2) (231-5012-00), #10-24 Keps Nut (Qty. 2) (240-5207-00), #8 X 1/2" SHWH AB Zinc (Qty. 1) (234-5101-00) and #10 Washer 7/32" ID X 1/2" OD X 1/16" (Qty. 1) (242-5003-00) Lockdown Spring (connected to handle) 265-5008-00 Flipper Switch Single (Paliney Contact) 2 500-6889-01 23 Assembly Parts Included: Flipper Switch Stack Single (Paliney Contact) (180-5160-01) and Capacitor - Ceramic .05 Mid 25 volt (130-5001-00) Item 23 is secured to Cabinet by: #6 X 1-1/4 SHWH AB (Zinc) (Qty. 2/per) (237-5959-00) Start Button Switch (ONLY) 180-5174-00 Grills 2-1/2" X 18" (on Back & Bottom) 26 545-5072-02 Plumb Bob Tilt Switch (made up of 4 individual parts) 27 27A Bracket for Hanger Wire 535-5221-00 27B Hanger Wire 1 535-5319-02
27C Contact Wire Form 1 535-7563-01
27D Plumb Bob Weight (includes Thumb-Screw) 1 535-5029-00
Item 27A is secured to Cabinet by: #8 X 1/2* SHWH AB (Zinc) (Qty. 4) (234-5101-00) 28L Slide & Pivot Support Bracket (Left) 535-5989-00 28R Slide & Pivot Support Bracket (Right) 535-5990-00 Items 28L & 28R are secured by: #10-24 X 1-1/4" Carriage Bolt Square Neck Black (3/per) (231-5012-00) and #10-24 KEPS Nut (3/per) (240-5207-00) Transformer 5.7v AC (with Ballast Winding) 010-5012-01 Item 29 is secured by: 1/4"-20 X 5/8" PPH MS (Zinc) (Qty. 4) (237-5854-00) and 1/4" Split Lock Washer (Qty. 4) (244-5000-00) Speaker Grill 7" X 7' 545-5072-03

Line Filter (150-5000-00), Varistor* TNR159211KM (Domestic) (150-5001-00), Varistor TRM15G431KM (Euro) (150-5002-00), On/Off Switch Bracket (535-8318-00), Power Box Decal (820-6123-03) and the following (noted in pictures above): Service Outlet (for USA) Line Cord 10' ROJ 3" & Ring Terminal 32A 180-5008-01 32B 034-5000-10 Recessed (Black) Cup (rear of Cab.) Snap Bushing 9/16" (White) Fuse 8 Amp 250v Slo-Blo (Domestic) 545-5122-00 32C 280-5001-01 32D 200-5000-05 Fuse 5 Amp 250v Slo-Blo (Foreign) (200-5003-00)32E 32F Fuse Holder 205-5001-00 Switch, On/Off Rocker APEM R2101C5NBB 180-5001-03 Cash Box Plastic Bottom 33 545-5090-00 Cash Box Cover (Validator) 34 535-5013-03 Cash Box Lock Bracket (U-Wire) 35 535-7562-00 Item 35 is secured by: #8 X 3/4 PFH (Zinc) (Qty. 2) (237-5822-00) Large Hair-Pin Clip 36 535-7772-00 3/4" Clamp (Single) 040-5000-08 37 Items 26-27 are secured to Item 1 by: #8 X 1/2" SHWH AB (Zc.) (Qty. 1/per) (234-5101-00) Zip Cable Tie (Screw Down Style) 3 040-5005-00 Item 38 is secured by: #8 X 7/8" PPH AB (Zinc) (Qty. 1/per) (232-5103-00) Meter +12v DC with Bracket optional G-0053-013-102 Meter +12v DC No Bracket Optional 40† G-0053-013-102A

† Meters (Diode included) are optional and were not included in this Pinball Machine (each optional meter is sold separately). More information? Call Technical Support.

Items 30 & 31 are secured by: #6-32 X 1-1/4" Fin Shank Screw (Qty. 4) (237-5883-00) and #6-32 Keps Nut (Qty. 4) (240-5008-00)

Assembly Parts Included: Power Box (No Parts) Mounting Frame (535-5932-00),

CAB. PARTS & SWITCHES

Speaker 8" Ø Round 8010 4Ω

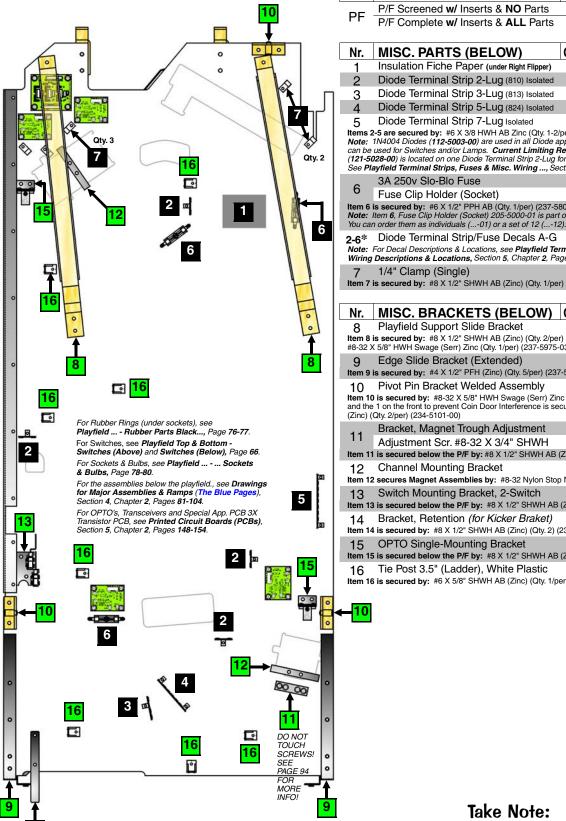
Power Input Box Assembly

NASGAR®

P/F Top - Misc. Parts and Brackets 10 Qty. 2 THE PLAYFIELD QTY. SPI PART Nr. Nr. Qty P/F Screened w/ Inserts & NO Parts Qty. 3 830-5100-86 P/F Complete w/ Inserts & ALL Parts 505-6004-86-86 Nr. **MISC. PARTS (ABOVE)** QTY. SPI PART Nr. Item 1 is secured by: #10-32 X 5/16" PFH U/C MS (Zinc) (Qty. 2) (237-6013-00) and to the P/F @ front tabs by: #8 X 1/2" SHWH AB (Zinc) (Qty. 3/per) (234-5101-00) For Decals, see P/F Top - Plastics Kit, Decals & Mylar Kits, Page 69. 2 Instruction Card (LICA) No. Instruction Card (USA) Nascar® 755-5186-00-Y **Note:** Visit **www.sternpinball.com** for a PDF copy of the Game Instruction Card which will also have any translated Instruction Cards made for this game. Find Game Link or Archives. Spanish 755-5186-02-Y; French 755-5186-05-Y Coin Card (2-Sided) Yellow Stock 755-5400-00-Y Coin Card (2-Sided) Yellow Stock 3B 755-5400-02-Y For Coin Card views, see below or **Appendix J** (back of manual). **Ordering Note:** If this is a non-US Game, Coin Card(s) Part Numbers provided will differ. Qtv. 2 Mini-Mars Lite Cover (Screw-On) (Yel.) 550-5031-06 Item 4 is secured on Plastic by: #6-32 X 1/2" PPH MS (Sems) Zinc (Qty. 2) (232-5202-00) and #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00) **Bubble Level Assembly** 500-6815-00 For Switches, see Playfield Top & Bottom Assembly <u>Parts Included</u>: Level .8mm Empire #0224 (**545-6001-01**) or Level Mount (**545-6068-00**). Flange secured by: #6-32 X 1/4" PPH MS (no Sems) Zinc (237-5500-00) and #6-32 Keps Nut (240-5008-00) Item X is secured to the wood rail by: #6 X 1/2" HWH AB (Zinc) Red (Qty. 2) (234-5001-02) Switches (Above and Switches (Below), Page 66. For Roll-Under Gates, see Playfield Top -Roll-Under Gates & Spinner, Page 67 For Plastics & Decals, see Playfield Top - Plastics (Screened & Clear) Kit, Decals Pinball (Steel) 1 1/6 g 260-5000-00 Plug-Cap (3/16") Black Plastic & Mylar Kits, Page 69. 545-5232-01 Note: Item 7 should plug hole if a Center Post (@ Drain) is used, then removed. Qty. 2 MISC. BRACKETS (ABOVE) QTY. SPI PART Nr. Bracket, Ball Trough Stop plate 8 535-9743-00 15A under ball Item 8 is secured above the Playfield in front of the Coil Mounting Bracket of the 4-Ball Trough (Item 2, Page 83) by: #6 X 1/2" HWH AB (Zinc) Red (Qty. 2) (234-5001-02) 15B Bracket, Vertical Plastic Mounting 535-8941-00 Note: Joins Plastics 830-6035-06 + 830-6036-35 10® Bracket, Vertical Plastic Mounting 535-8941-04 Qty. 2 11® Bracket Long, Plastic Cover Mounting 535-9744-00 Note: Joins Plastics 830-6035-11 + 830-6035-27, 830-6035-05 + 830-6035-18, 830-6047-19 + 830-6047-20 and 830-6036-31 + 830-6036-32 + 830-6036-33 Items 9@-11@ are secured to each Plastic at hole by: Rivet, $1/8" \circ X 5/32"$ Long (Qty. 1/per) (249-5009-00) Replacement may require Rivet, $1/8" \circ X 3/16"$ Lg (Qty. 1/per) (249-5001-00) and #6 Riveting Lock Washer (Qty. 1/per) (246-5000-00) For Plastics (Screened & Clear), see P/F Top - Plastics Kit, Decals & Mylar Kits, Page 69. 0.0 Bracket, Ramp Mounting 515-6508-00 Item 12 is secured to the Wood Rails by: #6 X 1/2" PTH A (Zinc) (Qty. 2) 237-5809-00 Bracket, Playfield Hanger 535-8385-00 Item 13 is secured to the Playfield by: #8-32 X 7/8" HWH MS Zinc (Qty. 2/per) (237-5890-00) and #8-32 T-Nut (Qty. 2/per) (240-5101-00) Bracket, Back Panel Mounting (Left) 535-9645-00 14R Bracket, Back Panel Mounting (Right) 535-9645-01 Items 14L & 14R are secured above the Playfield by: #8-32 X 5/8" SHWH Ser. Swage (Zinc) Wax (Qty. 2/per) (237-5975-03) and #8-32 T-Nut (Qty. 2/per) (240-5101-00) For Back Panel & Parts, see Drawings for Major Assemblies & Ramps, Page 103. 15A Plate (Bracket) for the Newton Ball 535-9523-00 15B Bracket (Wire Form) Ball Retention 535-9522-00 Items 15A-15B are secured by: #8 Washer (Qty. 1/per) (242-5005-00) and #8-32 Nylon Stop Nut (Qty. 1/per) (240-5102-00) 5 Optional Kits available through your Distributor: Qty. 2 Pinball Location Maintenance <u>Standard</u> Kit: 502-600<u>2</u>-86 See Appendix J at the back of this manual for all current Cards (USA, Canada, Euro & Int'l) available through your distributor or download via our website Kit includes: 8 oz. Novus Wax #2 Fine (Red) (675-0003-01), Cloth, Rubber Rings (used above playfield), Bulbs (Bulb quantities vary and is limited to 25 per type), Fuses (5/per type) and 4 Pinballs. **Note:** Quanties, sizes and contents subject to change without notice. Pinball Location Maintenance Deluxe Kit: 502-6003-86 1 Deluxe Kit includes: Pinball Location Maintenance Standard Kit as described plus a quanity of Flipper Rebuild Kits. *Note: Quantity varies which equals the same quantity of flippers used in this game.* ◀ THIS GAME KIT INCLUDES (2) FLIPPER REBUILD KITS \$1.00 NALUE Take Note: Legend Note: SUPE 3A 2 Items noted with a white square are Misc. Parts (Above). Items noted with a cyan square are Misc. Brackets (Above).

Section 4, Chapter 1 Page 64





Nr.	THE PLAYFIELD	QTY.	SPI PART Nr.
DE	P/F Screened w/ Inserts & NO Parts	1	830-5100-85
PF	P/F Complete w/ Inserts & ALL Parts	1	505-6004-85-85

	Nr.	MISC. PARTS (BELOW)	QTY.	SPI PART Nr.			
	1	Insulation Fiche Paper (under Right Flipper)	1	545-5721-00			
	2	Diode Terminal Strip 2-Lug (810) Isolated	4	055-5203-00			
ĺ	3	Diode Terminal Strip 3-Lug (813) Isolated	1	055-5204-03			
	4	Diode Terminal Strip 5-Lug (824) Isolated	1	055-5204-05			
'	5	Diode Terminal Strip 7-Lug Isolated	1	055-5204-07			
	Items 2-5 are secured by: #6 X 3/8 HWH AB Zinc (Qty. 1-2/per) (234-5000-00).						
		1N4004 Diodes (112-5003-00) are used in all Diode a					
		used for Switches and/or Lamps. Current Limiting F					
		028-00) is located on one Diode Terminal Strip 2-Lug t					
Ι.	See Pl	ayfield Terminal Strips, Fuses & Misc. Wiring, Se	ction 5 , C	napter 2 , Page 111 .			
	_	3A 250v Slo-Blo Fuse	3	200-5000-08			

Fuse Clip Holder (Socket) 205-5000-01 Item 6 is secured by: #6 X 1/2" PPH AB (Qty. 1/per) (237-5805-00)

Note: Item 6, Fuse Clip Holder (Socket) 205-5000-01 is part of a set of 12 (205-5000-12).

2-6* Diode Terminal Strip/Fuse Decals A-G 820-6221-86 Note: For Decal Descriptions & Locations, see Playfield Terminal Strips, Fuses & Misc. Wiring Descriptions & Locations, Section 5, Chapter 2, Page 111.

Item 7 is secured by: #8 X 1/2" SHWH AB (Zinc) (Qty. 1/per) (234-5101-00)

SPI PART Nr. MISC. BRACKETS (BELOW) QTY.

8 Playfield Support Slide Bracket 2 535-6862-02 ltem 8 is secured by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2/per) (234-5101-00) and #8-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 1/per) (237-5975-03)

Edge Slide Bracket (Extended) 535-5988-01 Item 9 is secured by: #4 X 1/2" PFH (Zinc) (Qty. 5/per) (237-5840-00)

10 Pivot Pin Bracket Welded Assembly 500-5329-03 Item 10 is secured by: #8-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 2/per) (237-5975-03) and the 1 on the front to prevent Coin Door Interference is secured by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2/per) (234-5101-00)

Bracket, Magnet Trough Adjustment 515-7544-00 Adjustment Scr. #8-32 X 3/4" SHWH 2 237-6010-00 ltem 11 is secured below the P/F by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2) (234-5101-00) Adjustment Scr. #8-32 X 3/4" SHWH

Channel Mounting Bracket 535-9504-00 Item 12 secures Magnet Assemblies by: #8-32 Nylon Stop Nut (Qty. 2/per) (240-5102-00)

Switch Mounting Bracket, 2-Switch 535-9630-00 Item 13 is secured below the P/F by: #8 X 1/2" SHWH AB (Zc.) (Qty. 2) (234-5101-00)

14 Bracket, Retention (for Kicker Braket) 535-9754-00 Item 14 is secured by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2) (234-5101-00) Also see Pg. 94.

15 OPTO Single-Mounting Bracket 535-9400-00

Item 15 is secured below the P/F by: #8 X 1/2" SHWH AB (Zc.) (Qty. 2/per) (234-5101-00)

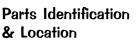
Tie Post 3.5" (Ladder), White Plastic 545-5253-01 Item 16 is secured by: #6 X 5/8" SHWH AB (Zinc) (Qty. 1/per) (234-5002-00)

Take Note:

* An asterisk (*) indicates item(s) are not noted in the pictorials.

Legend Note:

Items noted with a black square are Miscellaneous Parts (Below). Items noted with a green square are Misc. Brackets (Below).





Playfield Top & Bottom - Switches (Above) and Switches (Below)

Nr. SWITCHES QTY. SPI PART Nr. A-# Roll-Over Switch (Left Mount Style) 2 500-6227-01

Switch Matrix Numbers 57 & 61

4 500 0007 00

B-# Roll-Over Switch (Right Mount Style) 4 500-6227-02 A-# & B-# Brackets secured by: #6 X 1/2" SHWH AB (Zinc) (Qty. 2/per) (234-5001-02) Switch Matrix Numbers 25, 26, 58 & 60

C-38 Switch & Target Asm. Square (Yellow) 1 500-5232-06

**Assembly includes: Switch & Square Target (Yellow) Only Sub-Asm. (515-5162-06),

Switch Mounting Bracket (535-6896-00), Switch Back Plate (535-6452-00) and Foam Pad (626-5029-00)

Bracket secured to Playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2) (234-5101-00) Switch Matrix Number 38

D-36 Switch & Sq. Target (Yel.) Only Sub-Asm. 2 515-5162-06
Switch Matrix Number 36 Switch Note: Either target hit closes Switch 36.

E-# Switch & Target Asm. Narrow (Yellow) 3 500-5857-06

Assembly includes: Switch & Narrow Target (Yellow) Only Sub-Asm. (515-5967-06),

Switch Mounting Bracket (535-6896-00), Switch Back Plate (535-6452-00) and Foam Pad (626-5029-00)

Items D-36-E-# secured to Playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2) (234-5101-00) Switch Matrix Numbers 43, 44 & 45

F-16 Switch (for Shooter Lane) 1 180-5200-00
Associated Part Not Included: Switch Mounting Bracket (535-9742-00)

Bracket secured to Playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2) (234-5101-00) Switch Matrix Number 16

G-28 Switch (No Side Bend Actuator) 1 180-5178-00 Switch Matrix Number 28

H-27 Switch (Medium Side Bend Actuator) 1 180-5179-00 Switch Matrix Number 27

Associated Part Not Included: Switch Mounting Bracket (535-9630-00) for Sws. 27 & 28 Bracket secured to Playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2) (234-5101-00)

j-# Sw. (11/4" Actuator) (*Car, Spinners & Ramp*) 4 180-5010-04 Item I-# is secured by: Same screws which secures the Sw. Protect Plate & Plastic Spacer Switch Matrix Numbers 24, 33, 40 & 42

J_# Switch Asm., Stack (Blade) (for Pops) 3 515-6459-09

Assembly Parts Included: Switch (180-5015-04), Sw. Mounting Bracket (535-7342-00),
Spoon Actuator (545-5610-02), Sw. Body Protect Plate (535-7344-00), Diode 1N4004
(Qty. 1/per) (112-5003-00) and #6-32 X 3/4" HWH (Zinc) (Qty. 2/per) (237-5976-05)

Bracket secured to Playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2/per) (234-5101-00)

Switch Matrix Numbers 49, 50 & 51

K-# Switch (Heavy Duty) Y-Actuator Switch Matrix Numbers 29, 30 & 52

3 180-5116-01

L-# Switch (Roller Actuator, Lite-Force) 3 180-5119-02

**Associated Parts Not Included: Heat Shrink Tubing 1/8" Ø PUI-24 (Qty. 1" per) (605-5006-00) and Diode 1N4004 (Qty. 1/per) (112-5003-00)

(605-5006-00) and Diode 1N4004 (Qty. 1/per) (112-5003-00) Item L-# is secured by: #2-56 X 1/2" Unslt HWH #4 Hex TR3 Blk (Qty. 2/per) (237-5937-02) Switch Matrix Numbers 11. 12 & 13

M-# Dual OPTO TRANS PC Board Asm. 1 515-0173-00

**Assembly Parts Included*: Dual OPTO Trans. PCB (Qty. 1) (520-5173-00), OPTO PCB

Tube Spacer (Brass) (Qty. 3) (530-5308-02) and Rubber Grommet (Qty. 3) (545-5518-00)

Item M-# is secured by: #6-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 3/per) (237-5976-04)

N_# Dual OPTO REC PCB Assembly 1 515-0174-00

Assembly **Parts Included: Dual OPTO Rec. PCB (Qty. 1) (520-5174-00), OPTO PCB Tube

**Spacer (Brass) (Qty. 3) (530-5308-02) and Rubber Grommet (Qty. 3) (545-5518-00)

Item N-# is secured by: #6-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 3/per) (237-5976-04)

Switch Matrix Numbers 14 & 15 Switch Note: Both PCBs required per switch.

O-# OPTO Transceiver PCB Assembly

Switch Matrix Numbers 20, 21, 32, 34, 35, 37, 47 & 48

Switch Note: 1 pair per switch. For a break-down of parts, wiring & schematics, see Printed Circuit Boards (PCBs), Section 5, Chapter 4, Pages 148-151.

P-# Switch (End-of-Stroke), Stack (Blade) 2 180-5149-00 | Item P-# is secured by: #6-32 X 5/8" HWH Sw (Sr) Zinc (Qty. 2/per) (237-5976-04)

Dedicated Switch Numbers DS-2 & DS-4
Q-# Switch, Stack (Blade) (for Slings)
4 180-5054-00
Associated Parts Not Included: Switch Body Protect Plate (Qty. 1/per) (535-5045-00) and
Diode 1N4004 (Qty. 1 for every 2 connected together) (112-5003-00)
Item Q-# is secured by: #6-32 X 5/8" HWH Swage (Ser.) Zinc (Qty. 2/per) (237-5976-04)

Item Q-# is secured by: #6-32 X 5/8" HWH Swage (Ser.) Zinc (Qtý. 2/per) (237-5976-04)

Switch Matrix Numbers 59 & 62 Switch Note: 1 pair per switch.

R-# Switch (for Drop Target) 3 180-5158-00 Item R-# is secured by: #4-40 X 5/8" Slotted HWH C (Zinc) Wax (Qty. 2) (237-5945-00) Switch Matrix Numbers 17. 18 & 19

S-23 Switch (behind Back Panel on Ramp) 1 180-5057-00 Switch Matrix Numbers 23

Switches G-28, H-27, I-# and K-# above also requires :

Switch Body Protect Plate (Qty. 1/per) (535-6539-00), Diode 1N4004 (Qty. 1/per) (112-5003-00) and #2-56 X 1/2" Unsit Serr HWH #4 Hd TR3 Black (Qty. 2/per) (237-5937-02) or #2-56 X 7/16" MS Sems (Zinc) (Qty. 2/per) (237-5872-01) < | tem F-16 |

S-23 . . [J-50 O-20 B-25 J-49 i-24 J-51 € i-40 O-47 i-42 **B-26 O-48** K-52 D-36 Qty. 2 i-33 G-28 0 H-27 300000000 E-44 0-32 R-17 Qty. 2 R-18 R-19 K-29 C-38 E-45 "E-45" means, it is Switch Number E-# in the Part Table. The "-#" indicates more than 1 switch is present. So it is replaced with the Switch's Switch Matrix Numbe In this case, it is Switch Matrix Number 45 A-57 B-58 Q-59 Q-62 A-61 B-60 Q-62 Q-59 **₹0**) (09 Qty. 2 P-DS-2 **O-37** O-35 P-DS-4 M-14/15 **O-34** (N-14/15 Qty. 2 L-13 L-12 K-30 Take Note:

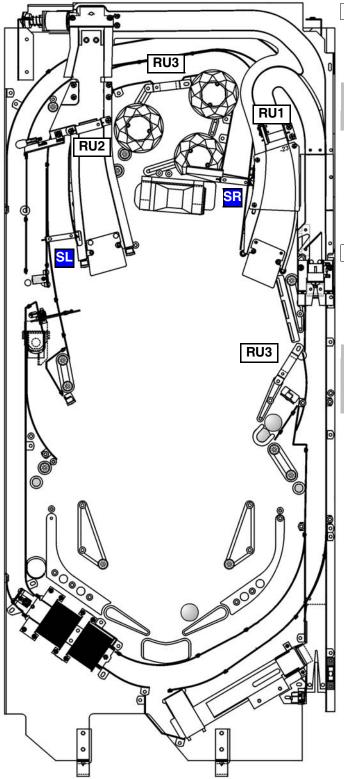
Legend Note:

Items noted with a white rectangle are Switches mounted above. Items noted with a black rectangle are Switches mounted below. The -# in the Item Number (Nr.) is replaced with the Switch Matrix Number of that switch (e.g. A-# is noted on the Playfield as A-57.

Note Items F - S: For better Switch view(s), see Drawings for Major Assemblies ... (The Blue Pages), Sec. 4, Chapter 2, (Page 81), (view Table of Contents for exact page).

*Note Items C - E: For better Target & Switch view(s) and breakdown of parts, see Appendix I, Pg. I1 (the end of this Svc. Game Manual).





ROLL-UNDER GATE PARTS QTY. SPI PART Nr.

RU1 Roll-Under Switch Gate

Ind. Parts Only

Individual Parts Only: Switch (180-5010-04), Switch Gate Bracket (535-9171-04) and Wire Form on Bracket (535-9172-01) (ASM. REF. 500-6593-01)

Item RU1 is secured to Item 1 by: #8-32 X 5/8" SHWH Sw. Ser (Zc.) (Qty. 2) (237-5975-03), #8-32 Hex Nut (Qty. 2) (240-5103-00) and #8-32 Nylon Stop Nut (Qty. 2) (240-5102-00) Switch Matrix Number 24

Ball Gate Bracket with Spring Flap 515-7436-00 RU2 Wire Form (Gate) (for above) 535-9683-00

Item RU2 is secured to Item 1® by: #8-32 X 3/8" PPH MS Ext. Sems (Zinc) (Qty. 1/per) (232-5301-00) and #8-32 Nylon Stop Nut (Qty. 2) (240-5102-00)

Bracket, 1-Way Gate (by Plast. -21 & -24) 535-9079-00 RU3 Wire Gate (for above) 535-5307-07

Item RU3 is secured by: #6-32 Nylon Stop Nut (Qty. 2/per) (240-5005-00)

Note: For views of Gates on Ramps, see Drawings ... Assemblies & Ramps (The Blue Pages), Section 4, Chapter 2, (Pages 100-102).

SPINNER PARTS Nr.

SPI PART Nr. QTY.

Spinner & Switch (by Left Ramp)

Ind. Parts Only

SL Spinner & Switch (1-1/4" Actuator) (180-5010-04), Spinner Mounting Bracket (535-8684-00), Spinner Target Sub-Assembly (515-7088-00) and Decals (reference only) (Kit: 802-5000-86) Note: Individual Decals (820-6371-37 & -38) are not available individually, ordering of kit is required. For all pieces, see P/F - Plastics (Screened & Clear) Kit. Decals & Mvlar Kits, Page 69.

Item SL is sec. under the Lt Ramp by: #6 X 1/2" PFH AB (Zinc) (Qty. 2) (237-5880-00) Switch Matrix Number 33

SR Spinner & Switch (by Right Ramp)

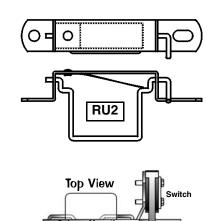
Ind. Parts Only:
Individual Parts Only: Switch (1-1/4" Actuator) (180-5010-04), Spinner Mounting Bracket (535-8684-00), Spinner Target Sub-Assembly (515-7088-00), Plastic Sign Mounting Bracket (535-9694-00), Plastic Creference only) (Kit: 802-5000-86) and Decals (reference only) (Kit: 802-5000-86) Mote: Individual Plastic (830-6035-14) and Decals (820-6371-39 & -40) are not available individually, ordering of kit is required. For all pieces, see PF - Plastics (Screened & Clear) Kit, Decals & Mylar Kits, Page 69.

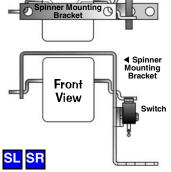
(ASM. REF. 500-6421-00-86R)

Take Note:

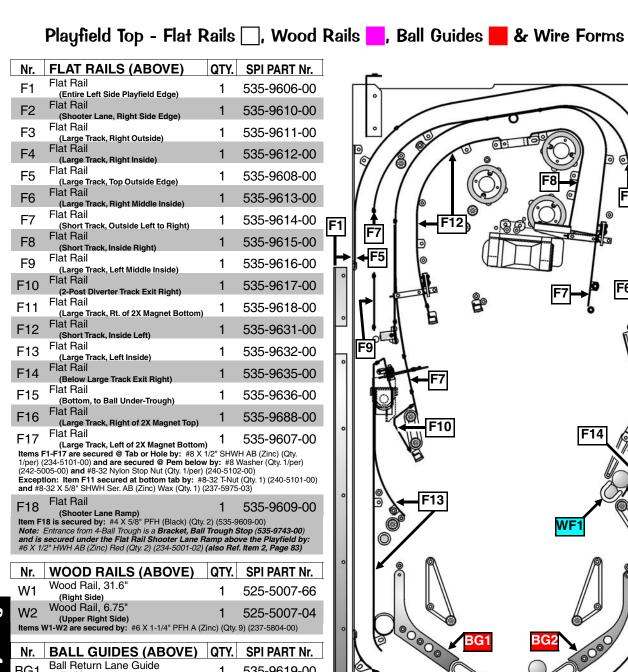
Legend Note:

Items noted with a white square
are Roll-Under Gates (with switch) and Gravity 1-Way Gates. Items noted with a blue square are Spinner Gáte(s).







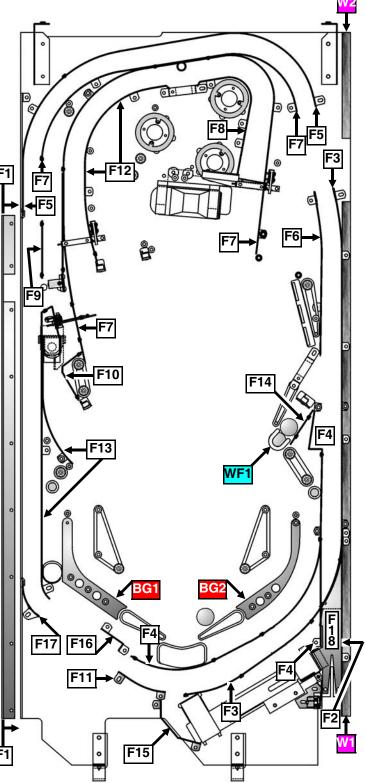


	(Right Side)	•	020 0007 00
W2 Items V	Wood Rail, 6.75" (Upper Right Side) V1-W2 are secured by: #6 X 1-1/4" PFH A (Z	1 (Qty.	525-5007-04 9) (237-5804-00)
Nr.	BALL GUIDES (ABOVE)	OTY	SPI PART Nr.
	DALL GOIDLO (ADOIL)	∞	•
BG1	Ball Return Lane Guide (Left)	1	535-9619-00

SPI PART Nr. WIRE FORMS (ABOVE) WF1 Wire Form (Neuton Ball) 535-9522-00

For Wire Forms on Roll-Under and 1-Way Gates, see Playfield Top - Roll-Under Gates & Spinner (previous Page), Page 67.

Items BG1-BG2 are secured by: See P/F Top - Plastic Posts & Spacers ...,

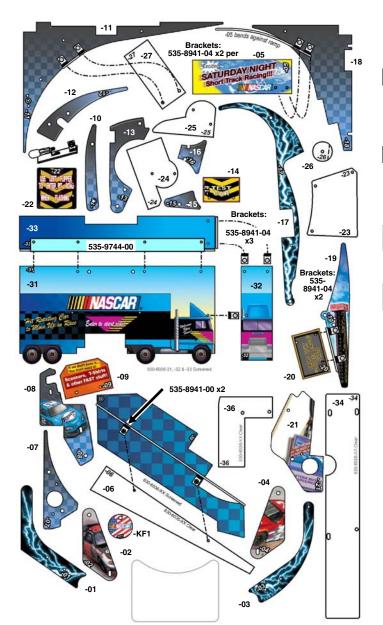


Take Note:

Legend Note:

Items noted with a white square are Flat Rails. Items noted with a magenta square are Wood Rails. Items noted with a red square are Ball Guides (Snubber Wires) Items noted with a cyan square are Wire Forms.





Playfield Top - Plastics (Screened & Clear) Kit, Decals & Mylar Kits ‡

PLASTICS (BUTYRATE) KIT

SPI PART Nr.

Kit: Playfield Plastics (Screened & Clear)

803-5000-86 Kit includes:

Screened & Clear Set (830-6035-XX & 830-6036-XX)

DECAL & MYLAR KITS

Kits: Playfield & Assembly Decals, Lexan & Mylar

802-5000-86 Kit (Decals) includes:

Playfield Decal Set (820-6371-XX) and

Left Ramp (820-6366-00) & Right Ramp (820-6366-01) Decals

Most last 2-digits are sequential. The following numbers were not used: -07, -13 thru -23, -26 thru -29, -45 thru -49 and -71+

802-5001-86 Kit (Mylar) includes:

Full Playfield Mylar (820-5999-86)

‡ Attention: No individual Plastic or Decal can be ordered separately, unless noted otherwise.

Other miscellaneous plastics and/or decals can be found on the Backbox & Speaker Panel Assemblies (Pages 60-61), Cabinet - Parts & Switches (Pages 62-63) and Playfield Bottom - Miscellaneous Parts & Brackets (Page 65)

Plastic Pieces are shown in the general area of where they are located (see game photo on Page 136 or any playfield drawing where the plastics pieces are in place).

* Note: The following pieces are positioned perpendicular on it's mate. They are riveted using brackets (see Playfield Top - Misc. Parts & Brackets, Page 64): -27 onto -11 (Upper Left), -05 onto -18 (Upper Right), -22 onto Left Ramp, -26 onto -19 (Middle Right), -06 onto -35 (Bottom Left), -31 & -32 (Semi-Truck) onto -33 (covers Motor & Rotating Plate on the Back Panel)

Note: For views & usage of plastics on Assemblies see Drawings for Major Assemblies and Ramps (The Blue Pages), Section 4, Chapter 2:-09 on Hot Dog Sign (Page 90); -23 over Right Ramp (Pages 100-101); -22 on Left Ramp (Page 102);

ect to ch

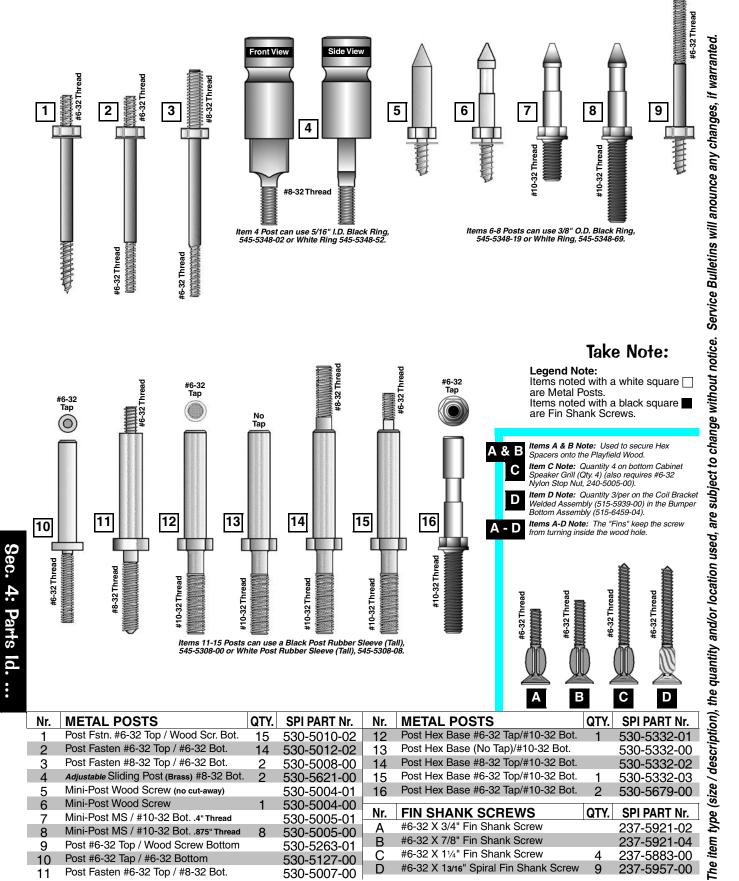
Decals are shown larger in comparison to the Plastic Set for clarity. Center Arch Decal (-10) Outline with plastics shows size in comparison.

Above: Plastic Kit 803-5000-86. Below: Decal Kit (802-5000-86, includes 820-6371-XX Playfield and 820-6366-XX Ramp Decals.



Parts Identification & Location





#6-32 Thread #6-32 Tap #6-32 Tap No Tap 11 12 13 14 15 16 10 #10-32 Thread #6-32 Thread #8-32 Thread #10-32 Thread #10-32 Thread #10-32 Thread #10-32 Thread Items 11-15 Posts can use a Black Post Rubber Sleeve (Tall), 545-5308-00 or White Post Rubber Sleeve (Tall), 545-5308-08.

Take Note:

Legend Note:

D

Items noted with a white square are Metal Posts.

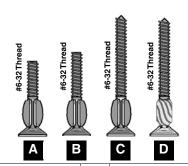
Items noted with a black square are Fin Shank Screws.

Items A & B Note: Used to secure Hex A & B Spacers onto the Playfield Wood. C

Item C Note: Quantity 4 on bottom Cabinet Speaker Grill (Qty. 4) (also requires #6-32 Nylon Stop Nut, 240-5005-00).

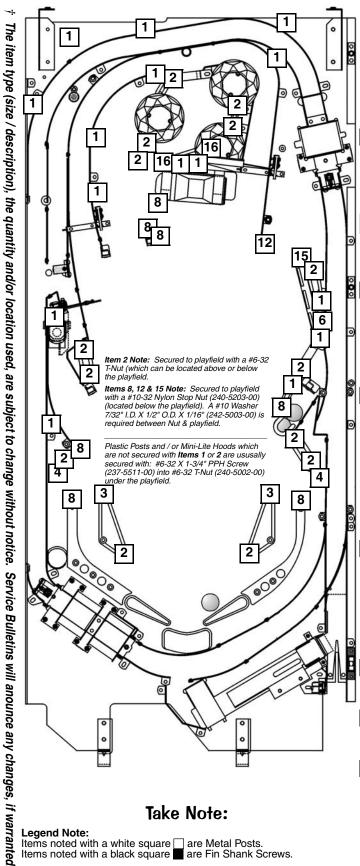
Item D Note: Quantity 3/per on the Coil Bracket Welded Assembly (515-5939-00) in the Bumper Bottom Assembly (515-6459-04).

Items A-D Note: The "Fins" keep the screw from turning inside the wood hole. A - D



Nr.	METAL POSTS	QTY.	SPI PART Nr.	Nr.	METAL POSTS	QTY.	SPI PART Nr.
1	Post Fstn. #6-32 Top / Wood Scr. Bot.	15	530-5010-02	12	Post Hex Base #6-32 Tap/#10-32 Bot.	1	530-5332-01
2	Post Fasten #6-32 Top / #6-32 Bot.	14	530-5012-02	13	Post Hex Base (No Tap)/#10-32 Bot.		530-5332-00
3	Post Fasten #8-32 Top / #6-32 Bot.	2	530-5008-00	14	Post Hex Base #8-32 Top/#10-32 Bot.		530-5332-02
4	Adjustable Sliding Post (Brass) #8-32 Bot.	2	530-5621-00	15	Post Hex Base #6-32 Top/#10-32 Bot.	1	530-5332-03
5	Mini-Post Wood Screw (no cut-away)		530-5004-01	16	Post Hex Base #6-32 Tap/#10-32 Bot.	2	530-5679-00
6	Mini-Post Wood Screw	1	530-5004-00		EIN OUANIK OODEWO	OT)	001 D4 DT 11
7	Mini-Post MS / #10-32 Bot4" Thread		530-5005-01	Nr.	FIN SHANK SCREWS	QTY.	SPI PART Nr.
8	Mini-Post MS / #10-32 Bot875" Thread	8	530-5005-00	_ A	#6-32 X 3/4" Fin Shank Screw		237-5921-02
9	Post #6-32 Top / Wood Screw Bottom		530-5263-01	В	#6-32 X 7/8" Fin Shank Screw		237-5921-04
10	Post #6-32 Tap / #6-32 Bottom		530-5127-00	С	#6-32 X 11/4" Fin Shank Screw	4	237-5883-00
11	Post Fasten #6-32 Top / #8-32 Bot.		530-5007-00	D	#6-32 X 13/16" Spiral Fin Shank Screw	9	237-5957-00

Playfield Top & Bottom Metal Posts — & Fin Shank Screws Continued



Take Note:

Legend	Note:

Items noted with a white square are Metal Posts.
Items noted with a black square are Fin Shank Screws.

Playfield Top & Bottom -	_
Nylon Stop, KEPS, Hex, T-, Flange	٤,
Pal & Wing Nuts* (Actual Size) †	,

	0
	Ton & Side







N	1	k 1	♣ 1	★ 1	F ₁
Nr.	NYLO	N STOP N	IUTS*	QTY.	SPI PART Nr.
N1	#6-32 I	Nylon Stop Nu	ut	49	240-5005-00

N1	#6-32 Nylon Stop Nut	49	240-5005-00		
N2	#6-32 N.S. Nut (with 1/4" Hex Body)	3	240-5010-00		
N3	#8-32 Nylon Stop Nut	51	240-5102-00		
N4	#10-32 Nylon Stop Nut	14	240-5203-00		
N5	#10-24 Nylon Stop Nut	2	240-5206-00		
Item N5 used with #10-24 X 1-3/4" Carriage Bolt Square Neck Black (231-5022-00) located in the Cabinet for the Roto Lock (Male) (355-5006-01).					
NIO	#4 40 Nulan Ctan Nut		040 5000 00		

Nr.	KEPS NUTS*	QTY.	SPI PART Nr.
N8	5/16"-18 Nylon Stop Nut		240-5316-00
N7	#4-40 (18/8 Stainless) Nylon Stop Nut		240-5303-01
N6	#4-40 Nylon Stop Nut		240-5303-00

	1(2) 0 1(0) 0	•	•
K1	#6-32 Keps Nut (with Star Washer)	4	240-5008-00
K2	#6-32 Keps Nut (with 1/4" Hex Body)		240-5011-00
K3	#8-32 Keps Nut		240-5104-00
K4	#10-32 Keps Nut		240-5208-00
K5	#10-24 Keps Nut	14	240-5207-00
K6	#4-40 Keps Nut		240-5318-00

	•		210 0010 00	
Nr.	HEX NUTS*	QTY.	SPI PART Nr.	
H1	#6-32 Hex Nut (No Star Washer)	4	240-5004-00	
H2	#8-32 Hex Nut	2	240-5103-00	
Н3	#10-32 Hex Nut		240-5201-00	
H4	#10-24 Hex Nut	2	240-5202-00	
Item H4 used with #10-24 X 1" Carriage Bolt Square Neck Black (231-5021-00) located in				
the Cabinet for the Side Armor Rear (towards Backbox).				

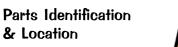
- inc ou	biliet for the Gide rumor ried (towards Edenbox).	
H5	#10-32 X 3/8" Hex Nut	240-5209-00
H6	³ ⁄ ₄ -16 Hex Nut	240-5315-00
H 7	#2-56 Hex Nut	240-5301-00
НΩ	⁷ ⁄₀"-14 Hex Nut	240-5317-00

Nr.	FLANGE NUT*	QTY.	SPI PART Nr.
T7	#10-24 T-Nut		240-5200-00
Т6	#10-32 X 5/16" T-Nut		240-5204-00
T5	#10-32 T-Nut (with Side Cut Off)		240-5205-00
T4	#10-32 (Black Oxide) T-Nut		240-5007-00
Т3	#8-32 T-Nut	19	240-5101-00
T2	#6-32 T-Nut (with Side Cut Off)		240-5002-01
T1	#6-32 T-Nut	22	240-5002-00
Nr.	T-NUTS*	QTY.	SPI PART Nr.
H8	⁷ / ₈ "-14 Hex Nut		240-5317-00

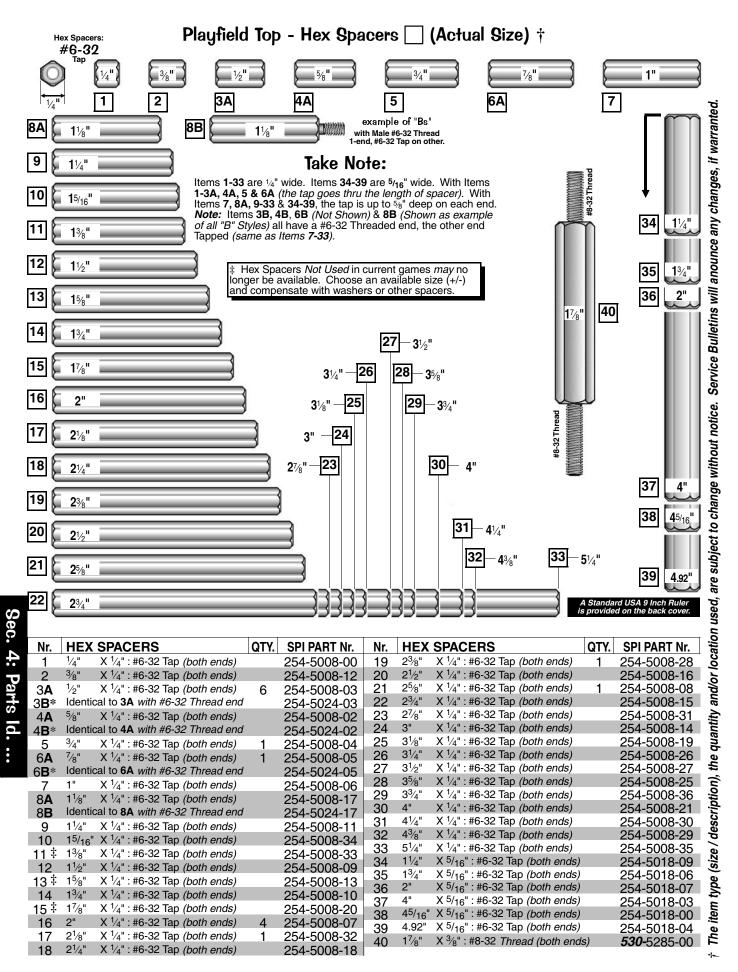
FI 74 A 20 Flarige Nut	12	240-5300-00
Item F1 used with 1/4-20 X 1-1/4 Sq. Neck Carriage Bolt Black	(231)	-5003-00) located in the
Cabinet for the SIde Armor (Front) and Pivot Hinges.		

Nr.	PAL NUTS*	QTY.	SPI PART Nr.
P1	Plastic Pal Nut (on Flipper Buttons)		240-5003-00
P2	Metal Pal Nut (on Flipper Buttons)	2	240-5003-01
Nr.	WING NUTS*	QTY.	SPI PART Nr.
W1	#6-32 Wing Nut		240-5001-00
W2	#8-32 Wing Nut		240-5100-00
W3	#10-24 Wing Nut		240-5211-00
W4	1/4"-20 Wing Nut	2	240-5302-00
\//5	1/4"-20 Toggle Wing		240-5324-00

Not Shown: Items N2-N8, K2-K6, H2-H8, T2-T7, P1-P2 & W1-W5

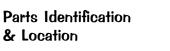






Take Note:

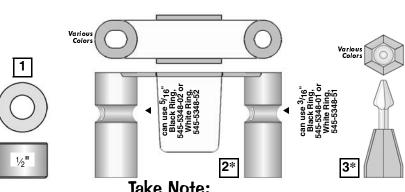
Legend Note: Items noted with a white square ☐ are Hex Spacers.

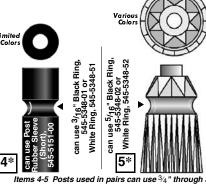


& Location

† The item type (size / description), the quantity and/or location used, are subject to change without notice. Service Bulletins will anounce any changes, if warranted







Items 4-5 Posts used in pairs can use 34'' through 3 Rubber Rings, see Rubber Parts for Part Numbers.

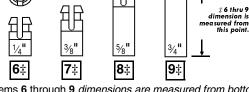
Take Note:

PLASTIC PART COLOR CHART

Nr.	Color	Nr.	Color	Nr.	Color
-00	Black	-06	Yellow	-12	Fluor. Blue
-01	Clear	-07	Orange	-13	Teal Green
-02	Red	-08	White	-14	Gray
-03	Amber	-09	Purple	-15	Luminescent
-04	Green	-10	Fluor. Orange	-16	Gold
-05	Blue	-11	Fluor. Green		

* Items 2 - 5 come in various colors (may not be available in every color). Item 4 is currently only available in the color(s) stated in this game manual (other colors used in prior games may no longer be available). The "-XX" or last 2-Digits in Part N°s which come in various colors, should be replaced with the desired 2-Digit Nº from the above Color Chart. Some colors may no longer be available for desired item.

‡ Items 6 through 9 dimensions are measured from bottom to just under the cut-away. Item 30 dimension is measured from top-to-top of curve. See pictorials with Items 9 & 30.

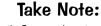




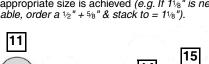
1"

10

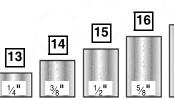
7/8" 24

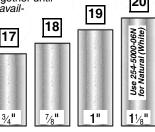


If any one of Items 11-23 Plastic Spacers is not available in the size required, order the smaller sized spacers required to stack sizes together until appropriate size is achieved (e.g. If $11_{\%}$ " is needed but unavailable, order a 1/2" + $5_{\%}$ " & stack to = $11_{\%}$ ").

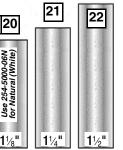


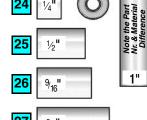
12





30‡





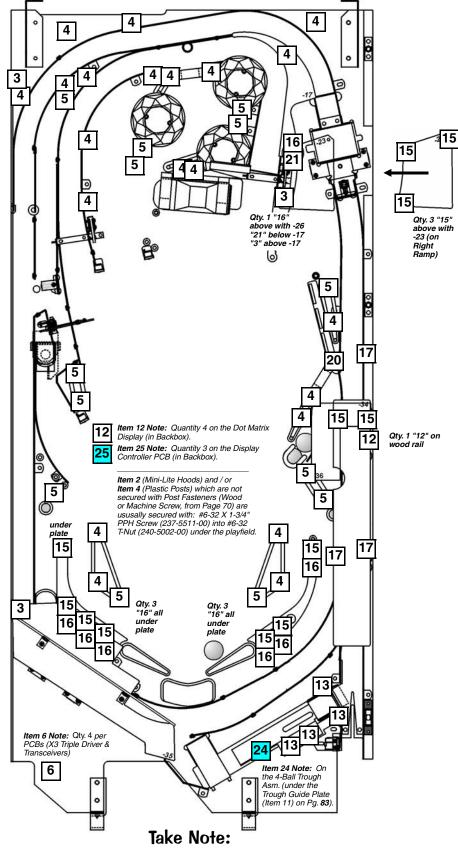
27	3/4"	
10		

28	11/8"	
-----------	-------	--

Nr.	PLASTIC POSTS & SPACERS	QTY.	SPI PART Nr.
1	3/8" X 1/2" Metal Spacer		530-5099-00
2**	Top Lane Plastic Mini-Lite Hood (Clr)		550-5061-XX
Item 2 to Washer	typically secured by: #6-32 X 1-3/4" PPH MS (Zinc) r 9/64" X 5/16" OD X 1/32" (Qty. 2/per) (242-5017-00),	(Qty. 2/p if used.	er) (237-5511-00) and
3**	Mini-Jewel Plastic Post (Clear)	4	550-5052-01
Item 3	typically secured by: #6 X 3/8" HWH AB (Zinc) (Qty.	1/per) (2	34-5000-00)
4**	1 ¹ / ₁₆ " 1-Groove Plastic Post (Black)		550-5059-00
4	1 ¹ / ₁₆ " 1-Groove Plastic Post (Clear)	26	550-5059-01
5**	1-Groove Jewel Plastic Post (Clear)	13	550-5034-01
	4 & 5 typically secured by: Post Fastening Screw #6- per) (530-5012-02, Item 6 Page 69).	32 Top /	#6-32 Bottom
6‡	1/4" SIf. Rtn. Plastic Spacer White	4	254-5007-02
7‡	3/8" Slf. Rtn. Plastic Spacer White		254-5007-01
8 ‡	5/8" Slf. Rtn. Plastic Spacer White		254-5007-00
9‡	3/4" Slf. Rtn. Plastic Spacer White		254-5007-03
10	1/2" X 1/4" Plastic Spacer White (Narrow)		254-5000-03
_11	1/8" X 3/8" Plastic Spacer Gray		254-5000-19
12	³ / ₁₆ " X ³ / ₈ " Plastic Spacer Gray	6	254-5000-18
13	1/4" X 3/8" Plastic Spacer Gray	4	254-5000-02

Nr.	PLASTIC POSTS & SPACERS	QTY.	SPI PART Nr.
14	3/8" X 3/8" Plastic Spacer Gray		254-5000-12
15	½" X 3/8" Plastic Spacer Gray	10	254-5000-01
16	5/8" X 3/8" Plastic Spacer Gray	7	254-5000-14
17	3/4" X 3/8" Plastic Spacer Gray	3	254-5000-07
18	⁷ / ₈ " X ³ / ₈ " Plastic Spacer Gray		254-5000-11
19	1" X 3/8" Plastic Spacer Gray	1	254-5000-04
20	11/8" X 3/8" Plastic Spacer Black	1	254-5000-06в
20	11/8" X 3/8" Plastic Spacer Natural		254-5000-06N
21	11/4" X 3/8" Plastic Spacer Gray	1	254-5000-05
22	11/2" X 3/8" Plastic Spacer Gray		254-5000-08
23	115/16" X 3/8" Plastic Spacer Gray		254-5000-15
24	¹ / ₄ " X ⁵ / ₁₆ " X .144" I.D. Metal Spacer	1	254-5014-03
25	¹ / ₂ " X ⁵ / ₁₆ " X .144" I.D. Metal Spacer	3	254-5014-00
26	9/ ₁₆ " X ^{5/} ₁₆ " X .144" I.D. Metal Spacer		254-5014-04
27	³ / ₄ " X ⁵ / ₁₆ " X .144" I.D. Metal Spacer		254-5014-01
28	11/8" X 5/16" X .144" I.D. Metal Spacer		254-5014-02
29	1" X ⁵ / ₁₆ " X .144" I.D. Metal Spacer		254-5001-00
30‡	7/8" Plastic Spacer Support (Dual-Locking)		254-5039-14

N451

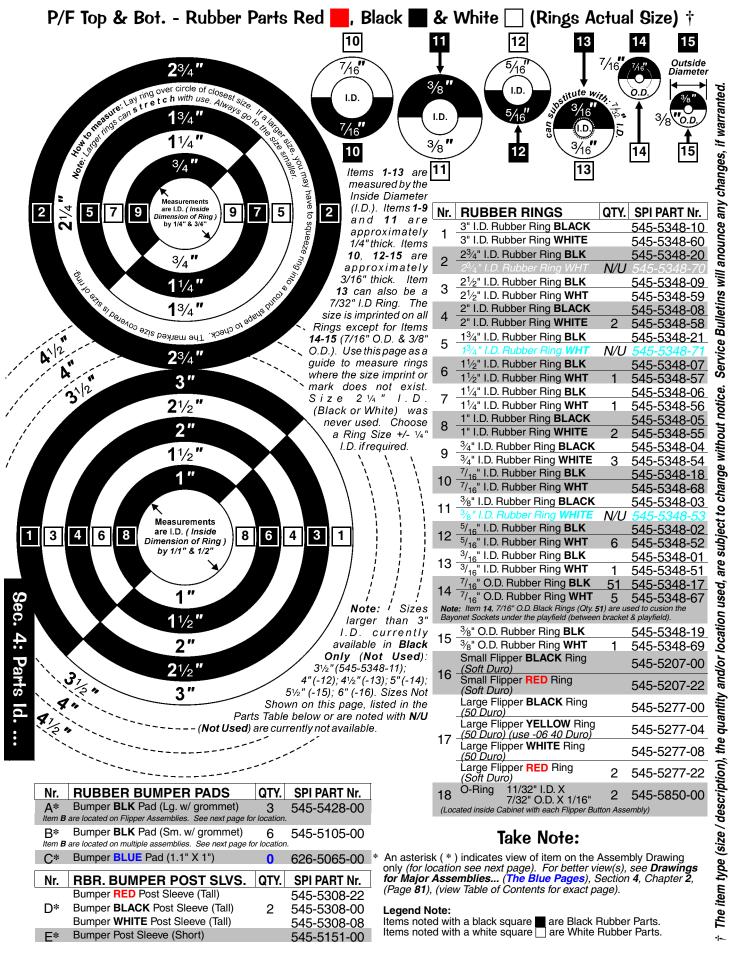


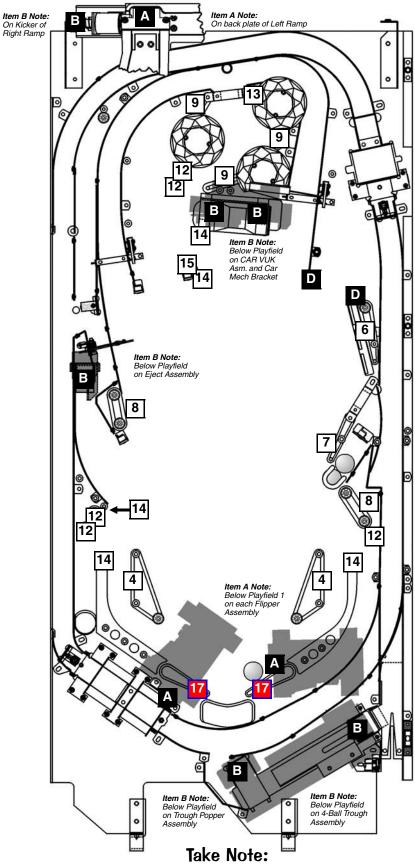
Legend Note:

Items noted with a white square are Plastic Posts & Spacers. Items noted with a cyan square are Metal Spacers.



The item type (size / description), the quantity and/or location used, are subject to change without notice. Service Bulletins will anounce any changes, if warranted





Leaend Note:

Items noted with a black square are Black Rubber Parts. Items noted with a white square are White Rubber Parts.

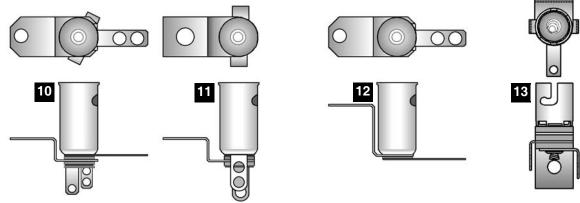


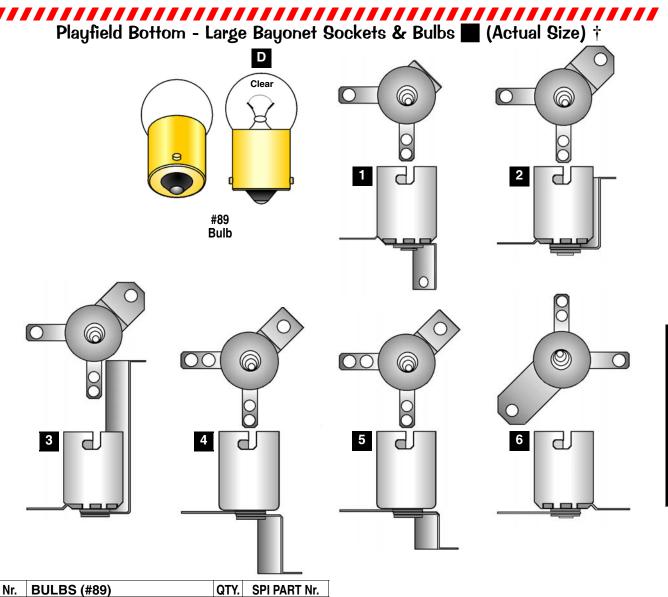
The item type (size / description), the quantity and/or location used, are subject to change without notice. Service Bulletins will anounce any changes, if warranted

Playfield Top & Bottom - Small Bayonet Sockets & Bulbs (Actual Size) † Α1 C Clear Yellow Red Amber Green Blue White #44 Bulbs Amber **LED Bulb** #455 or (Bayonet Style) Bulb 4 2 3 5 00 9 7 8 7 9 6

Nr.	BULBS (#44)	QTY.	SPI PART Nr.	Nr.	BULBS (LED & #455)	QTY.	SPI PART Nr.
^	#44 Bulb (Clear) Heavy Filament	54	165-5000-44-HF	В	LED Module (WHT) (12.8v 20-25mA) Bynt.		112-5023-08
Α	#44 Bulb (Yellow)	7	165-5053-06		Note: Different Colors available (not used in this game 12-5023-02); Amber (112-5023-03); Green (112-5023-03)		. (112-5023-05)·
	Note: Different Colors available (not used in this gam			1100 (1	7	04), Diu	, ,,
Red (1	65-5053-02); Amber (165-5053-03); Blue (165-5053-0	05); Orar	nge (165-5053-07)	С	#455 Twinkle Bulb		165-5003-00
Nr.	SMALL BAYONET SOCKETS	QTY.	SPI PART Nr.	Nr.	SMALL BAYONET SOCKETS	QTY.	SPI PART Nr.
1	2-Lug Staple Down Socket	12	077-5000-00	8	3-Lug Laydown Socket (3 Lugs Flat)		077-5006-00
2	3-Lug Stand-Up Socket (Med. Brkt.)		077-5008-00	9	2-Lug Stand-Up Socket (Tall Bracket)		077-5005-00
3	2-Lug Stand-Up Socket (Med. Brkt.)		077-5002-00	10	3-Lug Stand-Up Long Shell Socket		077-5013-00
4	2-Lug Stand-Up Sckt. (Short Bracket)	17	077-5002-31	11	2-Lug Stand-Up Lg. Shell Socket (GIs)		077-5031-00
5	3-Lug Staple Down Socket		077-5001-00	12	1-Lug S-U Lg. Shell Sckt. (Med. Brkt.)		077-5012-00
_ 6	2-Lug Laydown Socket	2	077-5003-00	13	3-Lug Laydown Socket (2 Lugs Bent)	4	077-5032-00
7	3-Lug Stand-Up Socket (Tall Bracket)	22	077-5009-00				

The item type (size / description), the quantity and/or location used, are subject to change without notice. Service Bulletins will anounce any changes, if warranted.





LARGE BAYONET SOCKETS QTY. SPI PART Nr. LARGE BAYONET SOCKETS QTY. SPI PART Nr. Nr. Nr. 2-Lug Laydown Standard Socket 2-Lug Stand-Up Rev. Mount Socket 077-5100-00 077-5103-00 2-Lug Stand-Up Short Socket 2-Lug Stand-Up Rv. Mnt. Short Socket 3 077-5101-00 077-5106-00 2-Lug Stand-Up Long Socket 2-Lug Straight Leg Socket 077-5102-00 077-5107-00

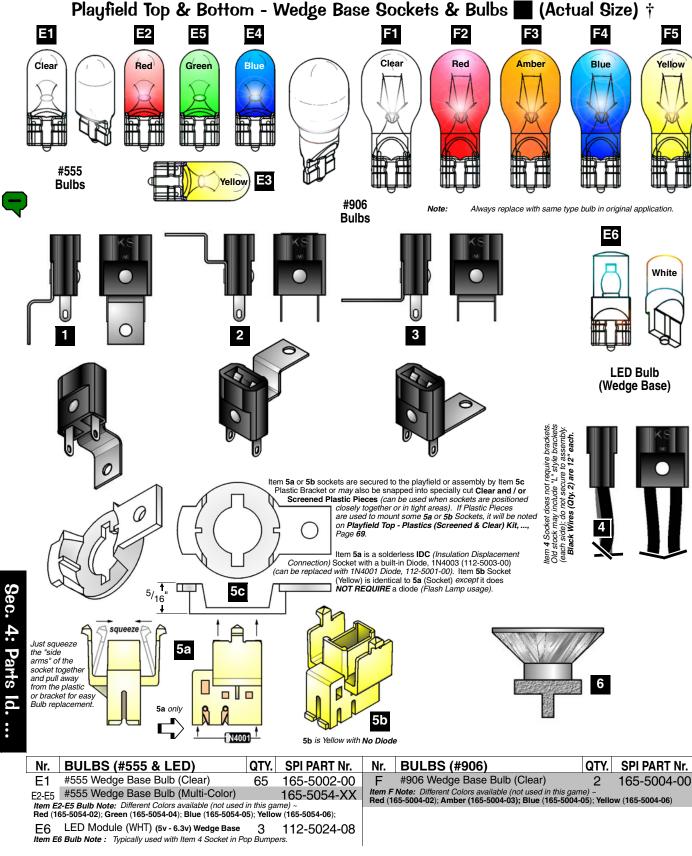
165-5000-89-HF

Parts Identification & Location

#89 Bulb Heavy Filament

The item type (size / description), the quantity and/or location used, are subject to change without notice. Service Bulletins will anounce any changes, if warranted





Nr.	WEDGE BASE SOCKETS	QTY.	SPI PART Nr.	Nr.	WEDGE BASE SOCKETS	QTY.	SPI PART Nr.
_ 1	Wedge Base Socket (Laydown)		077-5026-01	5 a	IDC Snap-On Socket (Biege)	63	077-5216-00
2	Wedge Base Socket (Offset)		077-5029-00	5 b	IDC Snap-On Socket <i>No Diode</i> (Yel.)		077-5216 -01
3	Wedge Base Socket (Laydown GI)		077-5030-00	5 c	5/ ₁₆ " Ht. Bracket (White)	63	545-5760-18
4	W.B. Socket (Bumpers/Special App.)	3	077-5206-00	6	Light Reflector (Silver Plastic)		545-5409-01
				Note It	tem 6: Typically used with Item 1 (but will fit on any s	imiliar We	edge Base Socket).

Page 80

Drawings for Major Assemblies & Ramps (The Blue Pages)

View Parts Id. & Location (for parts not described in this chapter) in Section 4, Chapter 1 of 2 (Pink Pages), Pages 59-80.

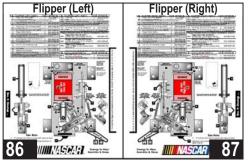
Table of Contents & Overview

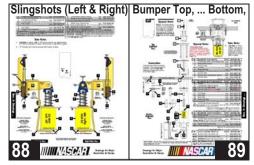
Drawings are provided for the Major Assemblies in this game with individual parts of each assembly numbered. Items noted with a white circle are mounted above the playfield; items noted with a black circle are mounted below. All numbered parts describe the NAME, QUANTITY & PART NR. & ASSOCIATED PARTS (AP-).



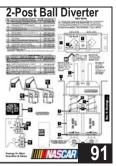


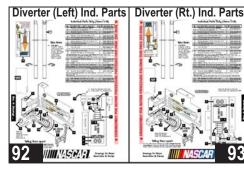






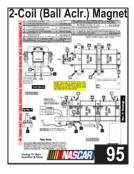


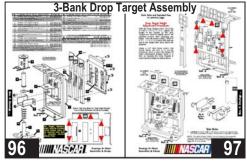


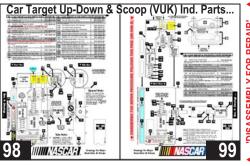








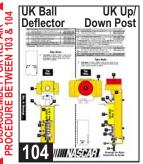








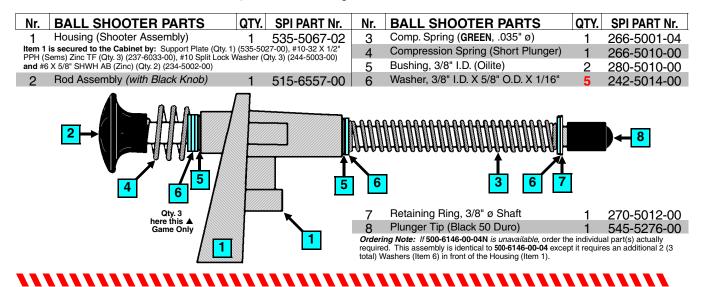




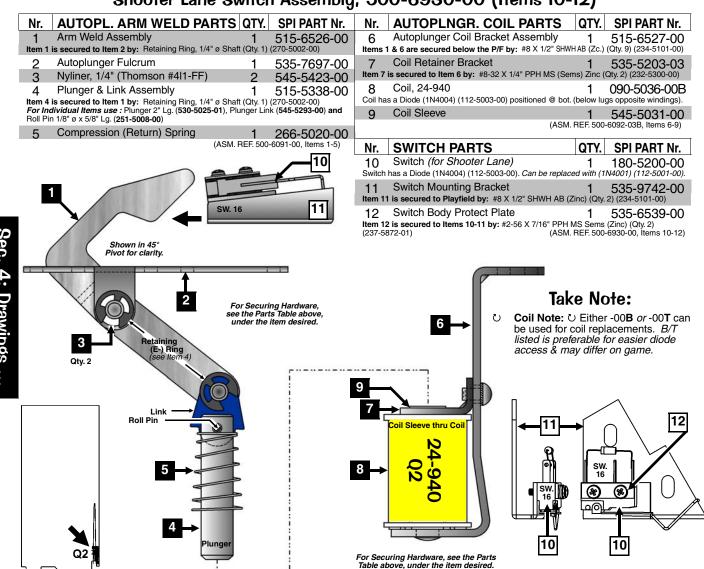
Drawings for Major Assemblies & Ramps



Ball Shooter (Plunger) Assembly, 500-6146-00-04N (Items 1-8)



Autoplunger Arm Weld Assembly, 500-6091-00 (Items 1-5) Autoplunger Coil Assembly, 500-6092-02B (Items 6-9) and Shooter Lane Switch Assembly, 500-6930-00 (Items 10-12)



Section 4, Chapter 2 Page 82



Drawings for Major Assemblies & Ramps

4-Ball Trough Assembly, 500-6318-24-86 (Items 1-13) and Associated Parts: See Parts Table Below.

Please Note: Items 1 & AP-A have been modified to work on this game only (note Part Numbers).

				ı				
Nr.	4-BALL TROUGH PARTS	QTY.	SPI PART Nr.	Nr.	4-BALL TROUGH PAR	TS	QTY.	SPI PART Nr.
1	Ball Trough Outhole M'nting Bracket Modified	1	515-6580-86	12	Dual OPTO TRANS Board A	ssembly	1	515-0173-00
Item 1	is secured below the playfield by: #8 X 1/2" SHWH	AB (Zc.)	(Qty. 4) (234-5101-00)	13	Dual OPTO REC Board Asset	embly	1	515-0174-00
2	Coil Mounting Bracket	1	535-7330-01		2 & 13 are secured by: #6-32 X 5/8" H			. 3/per) (237-5976-04)
Item 2	is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Sr.) Zinc	(Qty. 4) (237-5975-00)		<i>lividual Items use :</i> Dual OPTO Transm Receiver Board (Qty. 1) (520-5174-00), C			
3	Coil Retaining Bracket	1	535-5203-03		308-02) and OPTO PCB Rubber Gromm			
Item 3	is secured to Item 2 by: #8-32 X 1/4" SHWH (Serr)	Zinc (Qty	2) (237-5975-04)		ng Note: If 500-6318-24-86 is unavailab			
4	Coil, 26-1200	1	090-5044-00T		d. This assembly is identical to 500-6318 and fine to accommodate the Trough Popper			
Coil ha	s a Diode (1N4004) (112-5003-00) positioned @ top (above lu	s next to windings).		3 177	. ,, .	3	,
5	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01		ASSOCIATED PARTS ARE NOT INCL	UDED WITH	THE ABO	OVE ASSEMBLY.
_ 6	Steel & Nylon Plunger Assembly	1	515-5941-01	Nr.	ASSOCIATED PART(S	<u> </u>	QTY.	SPI PART Nr.
7	Compression (Return) Spring	1	266-5020-00	ΔP-A	Ball Trough Enter/Exit Scoop Mod		1	535-7329-01-86
8	Rubber Bumper (Grommet)	1	545-5105-00	Item A	P-A secured above the playfield (THIS	GAME ONL		1" X 3/8" Plastic
9	Micro Switch (Roller Actuator, Lite-Force)	3	180-5119-02	Spacer	Gray (Qty. 4) (254-5000-02) and #8 X 5	/8" SHWH AE	(Green)	(Qty. 4) (234-5102-04).
Item 9	requires: Heat Shrink Tubing 1/8" ø PUI-24 (Qty. 1"/p	er) (605-			Bracket, Ball Trough Stop This Gan		1	535-9743-00
Switch	has a Diode (1N4004) (112-5003-00). Can be replace	ed with (1	N4001) (112-5001-00).	Item A (234-50	P-B is secured above the Playfield by:	: #6 X 1/2" H	WH AB (Z	Zinc) Red (Qty. 2)
10	Sw. Body Protect Plate (Not Required w/# 11)	0	535-6539-00	,	,		_	260-5000-00
11	Trough Ball Guide Plate	1	535-7801-00		* Steel Balls (1-1/16" Ø) y of 4 used in this 4-Ball Trough Assemb	dy (2 ara cant	6	
	I is secured to Item 1 by: 1/4" X 5/16" X .144" I.D. Sp			Quariti	y 01 4 useu III IIIIs 4-Ball 110ugii Asseiiil	ny (z are capi	ive balls (лі ше гіаупеш.
(254-5)	014-03) and #2-56 X 1/2" HWH (Ser) UNS #4HD TR3	BO (Qty.	4) (237-5937-02)					

Take Note:

- * An asterisk (*) indicates item(s) are not noted in the pictorials.
- O Coil Note: O Either -00B or -00T can be used for coil replacements. B/T listed is preferable for easier diode access & may differ on game.

For a break-down of parts of Items 12 & 13, OPTO Boards (515-0173-00 & 515-0174-00), see Section 5, Chapter 4, Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic, Component Layout & Parts.

9

13

SW. 13

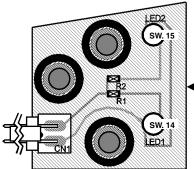


Shown Broken View to see complete switches

See Ordering Note Above.

Shown

Broken View



See securing hardware under Item 11

> Item 12, Dual OPTO TRANS (Transmitter) Board, 515-0173-00, is mounted on the other side of the Trough Assembly, in line with Item 13, Dual OPTO REC (Receiver) Board, 515-0174-00, using same hardware.

12

For Securing Hardware, see the Parts Table above, under the item desired.

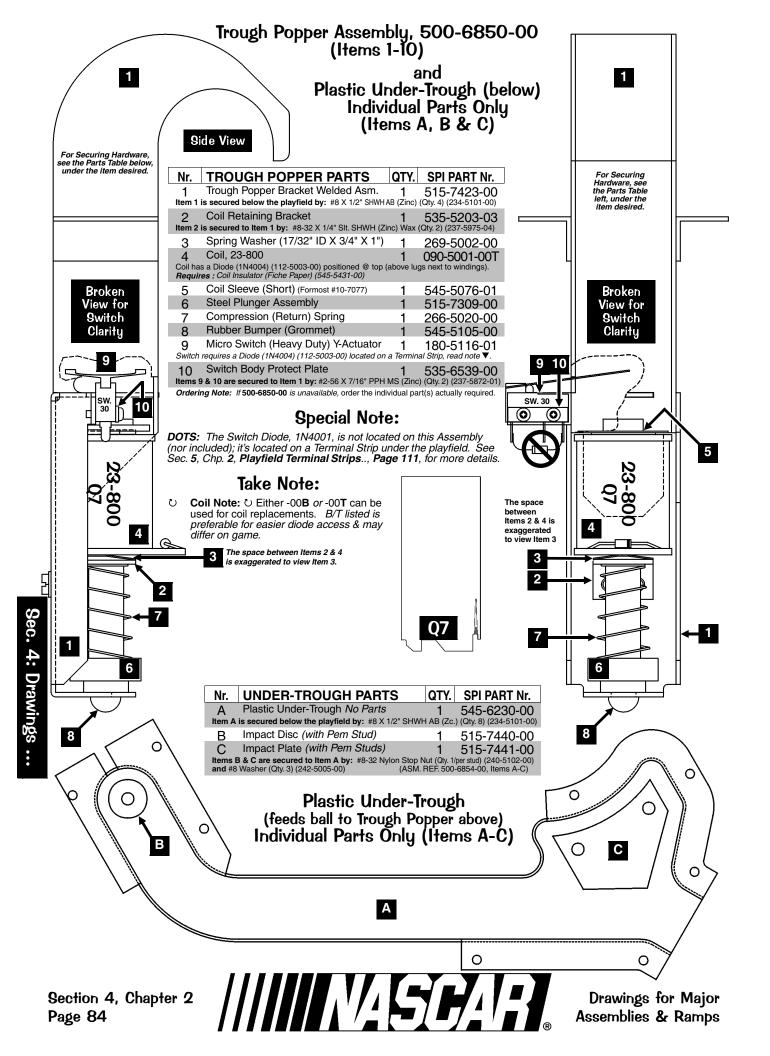
AP-A

5

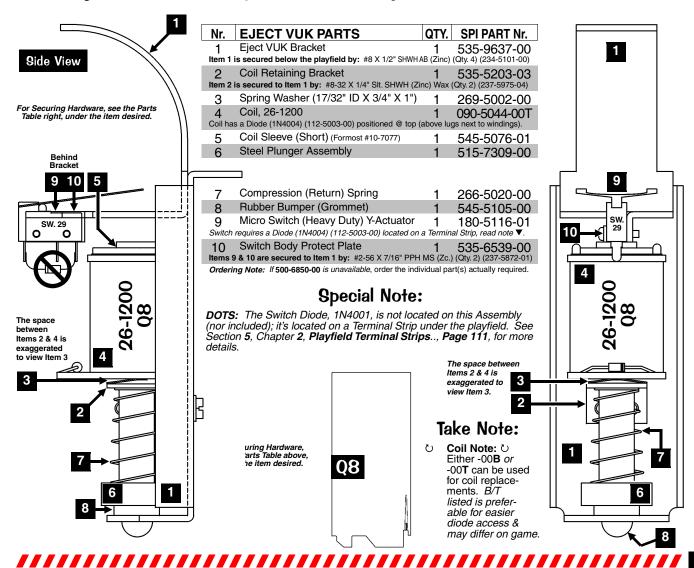
Cable Wiring Harness 036-5439-04 3-Pin Connector 045-5007-03 12-Pin Connector 045-5007-12

Drawings for Major Assemblies & Ramps



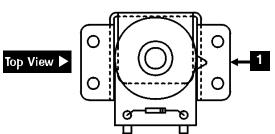


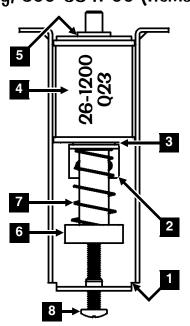
Eject VUK (Vertical Up-Kicker) Assembly, 500-6846-00 (Items 1-10)



Ball Deflector (Top Orbit) Assembly, 500-6841-00 (Items 1-8)

Nr.	BALL DEFLECTOR PARTS	QTY.	SPI PART Nr.
1	Ball Deflector Coil Mounting Bracket	1	535-6857-04
Item 1	is secured below playfield by: #8 X 1/2" SLT SHWH	AB (Zc)	(Qty. 4) (234-5101-00)
2	Coil Retaining Bracket	1	535-5203-03
Item 2	is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (Q	ty. 2) (23	2-5300-00)
3	Spring Washer, 17/32" ID X 3/4" X 1"	1	269-5002-00
4	Coil, 26-1200	1	090-5044-00T
Coil ha	s a Diode (1N4004) (112-5003-00) positioned @ top (a	above lu	gs next to windings).
5	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01
6	Solid Plunger Assembly (Tapered Top)	1	515-7089-00
7	Compression (Relay) Spring	1	266-5022-01
8	#10-32 x 1-1/4" PPH Adjustment Scr.	1	237-5708-00
Orderi	ng Note: If 500-6841-00 is unavailable, order the indiv	/idual pa	rt(s) actually required.





Take Note: O

Coil Note: O
Either -00B or
-00T can be used for coil replacements. B/T listed is preferable for easier diode access & may differ on game.



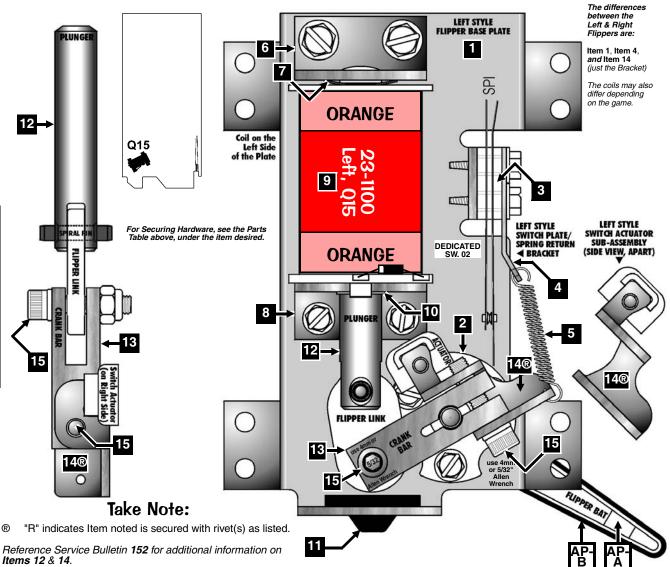
Drawings for Major Assemblies & Ramps



Flipper (Left) Assembly, 500-6543-14 (Items 1-15) and Assoc. Parts: Yellow Flipper Bat & Shaft Assy., 515-5133-06-06 (Items AP-A/-B)

		• •			•		
Nr.	FLIPPER (LEFT) PARTS	QTY.	SPI PART Nr.	Nr.	FLIPPER (LEFT) PARTS	QTY.	SPI PART Nr.
	Flipper Base Plate (LEFT) is secured below the playfield by: #10 X 1/2" HWH			13 Item 13	Crank Bar 3 requires: Bushing, .192" ø ID X .312" ø OD X .19	1 5" (Qty. 1)	530-5070-02 (530-5139-00)
2 Item 2	949-00) Ordering Note: Use Item FRP1, see the end Flipper Bat Bushing (White Plastic) 1/4" Ø I.D. is secured to Item 1 by: #6-32 X 3/8" HWH Swage	1	545-5070-00 (Qty. 3) (237-5976-02)	Actuato	Switch Actuator (LEFT) Sub-Assy. dividual Items use: Actuator & Spring Bracket (LE or (White Plastic) (545-5612-00) and is secured to 1/8" Ø X 1/4" Lg. (Qtv. 1) (249-5003-00)		
3 Item 3	Power (EOS / End-of-Stroke) Switch is secured to Item 1 by: #6-32 X 5/8" HWH Swage (Sw. Plate/Spring Return Brkt. (LEFT)	1 (Ser.) Zc. 1	180-5149-00 (Qty. 2) (237-5976-04) 535-7354 -01		Set Screw: #10-32 X 3/4" Socket Hd 5 requires: #10-32 Nylon Stop Nut (Qty. 1 Flipper L lit Lock Washer (244-5003-00) Tool Required for I	ink Side C	
5 6	Flipper Return Spring Coil Stop Bracket Sub-Assembly	1	265-5035-00 515-6308-01		per Rebuild Parts for Easier I		
Item 6	is secured to Item 1 by: #10-32 X 3/8" SHWH Swag 985-00) and #10 Split Lock Washer (Qty. 2) (244-5003			FRP1	Flipper Base Plate Kit (LEFT) Includes Item 1 pre-threaded, with th Securing Hardware for Items 2, 3, 6 of		515-6617 -01
7 8 Item 8	Spring Washer (17/32" ID X 3/4" X 1") Coil Support Bracket is secured to Item 1 by: #8-32 X 3/8" HWH Swage (1 1 (Ser.) Zc.	269-5002-00 535-7356-00 (Qtv. 2) (237-5975-00)	FRP2	Plunger, Link & Crank (LEFT) Assy	<u>'</u> .	515-7203 -01
9	Coil, 23-1100 (ORANGE) (Left) sa Diode (1N4004) (112-5003-00) positioned @ top (1	090-5030-00T	FRP3	Flipper (LEFT) Rebuild Kit	ove	500-6307 -10
10	Coil Sleeve Deflector Pad (Bumper)	1	545-5388-00 545-5428-00		ASSOCIATED PARTS ARE NOT INCLUDED WIT		OVE ACCEMBLY
12	Flipper Plunger & Link Sub-Assy.	1	515-6304-03	Nr.	ASSOCIATED PART(S)	QTY.	
(545-5	dividual Items use: Flipper Plunger (530-5349-01) are 611-01) and is secured to the Plunger by: Bushing, (530-5532-00) and Spiral Pin Ø 5/32" X 3/4" Lg. (Qtv.	, .16" ø ĬĒ	O X .281" ø OD X .187"	AP-A	YELLOW Flipper Bat (Plain) & Shaft (Non-Knurled End) Assembly	1	515-5133-06-06
(QIV. I	/ 1330-3332-007 and 3011at PM Ø 5/32 - X 3/4 - LQ. (QtV.	11(25)-3	3013-021		,		

AP-B Large Flipper RED Rubber Ring 545-5277-22



Section 4, Chapter 2 Page 86



Drawings for Major Assemblies & Ramps * To Order the Flipper (Left) Rebuild Kit ask for Part Nr.: 500-6307-10 (includes Items 6, 10, 12, 13, 14 & 15)

Flipper (Right) Assembly, 500-6543-04 (Items 1-15)

and Assoc. Parts: Yellow Flipper Bat & Shaft Assy., 515-5133-06-06 (Items AP-A/-B)



FLIPPER (RIGHT) PARTS QTY. SPI PART Nr. **FLIPPER (RIGHT) PARTS** QTY. SPI PART Nr. Nr. Nr. Flipper Base Plate (RIGHT) Crank Bar See FRP1 13 530-5070-02 Item 1 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00) Ordering Note: Use Item FRP1, see the end of this Parts Table. Item 13 requires: Bushing, .192" ø ID X .312" ø OD X .195" (Qty. 1) (530-5139-00) 14® Switch Actuator (RIGHT) Sub-Assy. 515-7257**-00** 2 Flipper Bat Bushing (White Plastic) 1/4" ø I.D. 1 545-5070-00 Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02) Flipper Bat Bushing (White Plastic) 1/4" ø I.D. For Individual Items use: Actuator & Spring Bracket (RIGHT) (535-9038-00) and ® Swil Actuator (White Plastic) (545-5612-00) and is secured to the Bracket by: Rivet, 1/8" ø X 1/4" Lg. (Qty. 1) (249-5003-00) Power (EOS / End-of-Stroke) Switch 180-5149-00 Set Screw: #10-32 X 3/4" Socket Hd. Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5976-04) 237-6144-00 Item 15 requires: #10-32 Nylon Stop Nut (Qty. 1 Flipper Link Side Only) (240-5203-00) and #10 Split Lock Washer (244-5003-00) Tool Required for Item 15: 5/32" or 4mm Allen Wrench Sw. Plate/Spring Return Brkt. (RIGHT) 535-7354**-00** Flipper Return Spring 5 265-5035-00 Flipper Rebuild Parts for Easier Installation, \$ave \$: 6* Coil Stop Bracket Sub-Assembly 515-6308-01 Flipper Base Plate Kit (RIGHT) Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) and #10 Split Lock Washer (Qty. 2) (244-5003-00) Includes Item 1 pre-threaded, with the Securing Hardware for Items 2, 3, 6 & 8. 515-6617**-00** Spring Washer (17/32" ID X 3/4" X 1") 269-5002-00 Plunger, Link & Crank (RIGHT) Assy Coil Support Bracket Includes above Items 12, 13, 14 and 15 535-7356-00 515-7203**-00** 8 Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00) and is pre-assembled. Flipper (RIGHT) Rebuild Kit Coil, 23-1100 (ORANGE) (Right) 090-5030-00T Same as FRP2, but also includes above 500-6307-00 Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings). Items 6 & 10. Coil Sleeve 545-5388-00 10 Deflector Pad (Bumper) 545-5428-00 11 ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY. Flipper Plunger & Link Sub-Assy. 12 515-6304-03 ASSOCIATED PART(S) QTY. SPI PART Nr. For Individual Items use: Flipper Plunger (530-5349-01) and Plunger "Flipper" Link (545-5611-01) and is secured to the Plunger by: Bushing, .16" ø ID X .281" ø OD X .187" (Qty. 1) (530-5532-00) and Spiral Pin ø 5/32" X 3/4" Lg. (Qty. 1) (251-5015-02) YELLOW Flipper Bat (Plain) & Shaft 515-5133-06-06 (Non-Knurled End) Assembly Large Flipper RED Rubber Ring 545-5277-22 The differences between the RIGHT STYLE FLIPPER BASE PLATE Left & Right Flippers are: 6 1 Item 1, Item 4, (just the Bracket) SP The coils may also differ depending on the game. **ORANGE** Coil on the **Right Side** of the Plate Q16 RIGHT STYLE SWITCH ACTUATOR RIGHT STYLE For Securing Hardware, see the Parts SWITCH PLATE/ Table above, under the item desired. SUB-ASSEMBLY (SIDE VIEW, APART) RING RETURN BRACKET > DEDICATED SW. 04 **ORANGE** 8 2 13 14® FLIPPER LINK 15 13 14® Take Note: "R" indicates Item noted is secured with rivet(s) as listed.

Drawings for Major Assemblies & Ramps

70

Order the Flipper (Right) Rebuild Kit ask for Part Nr.: 500-6307-00 (includes Items 6,

10, 12,

*1*3,

, 14 &



Items 12 & 14.

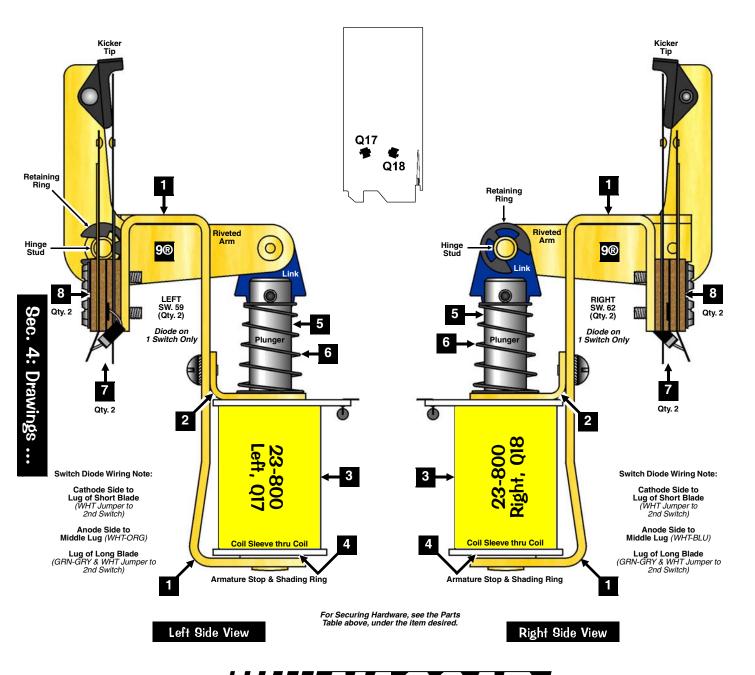
Reference Service Bulletin 152 for additional information on

Slingshot (Left & Right) Assemblies, 500-5849-00 (Qty. 2) (Items 1-9)

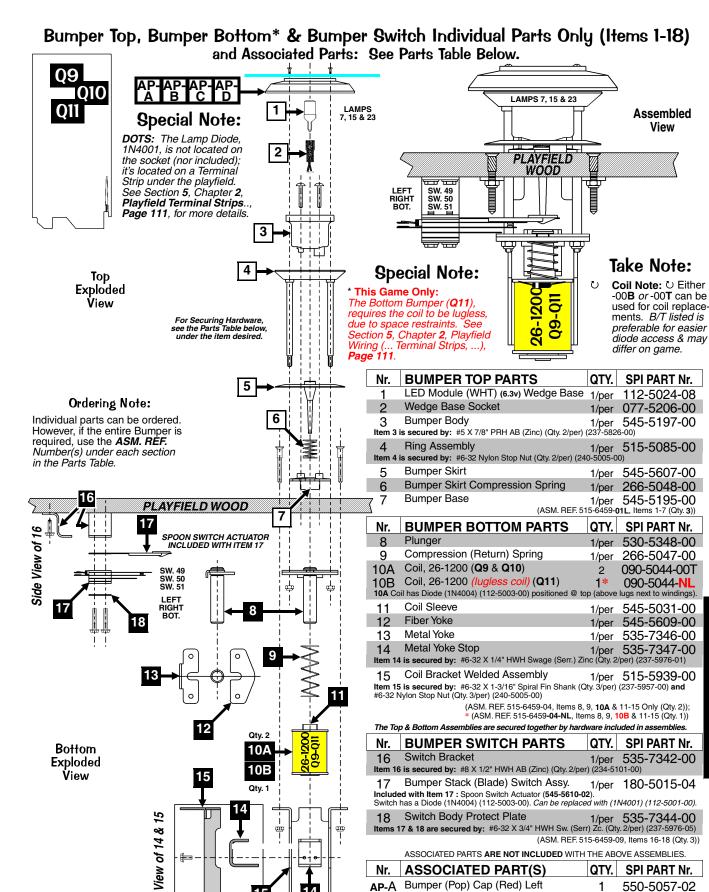
Nr.	SLINGSHOT PARTS	QTY.	SPI PART Nr.	Nr.	SLINGSHOT PARTS	QTY.	SPI PART Nr.
1	Slingshot Bracket Assembly is secured below the playfield by: #8 X 1/2" SHWH	1/per	515-5339-01	6	Compression (Return) Spring		266-5020-00
2	Coil Retaining Bracket is secured to Item 1 by: #8-32 X 3/8" PPH MS (Sem	1/per	535-5203-03		Slingshot Stack (Blade) Switch of the 2 Switches has a Diode (1N4004) (112-5003-01 replaced with (1N4001) (112-5001-00).		180-5054-00 lote Below on Drawing.
3	Coil, 23-800 s a Diode (1N4004) (112-5003-00) positioned @ top (1/per	090-5001-00T	8 Items 7	Switch Body Protect Plate ' & 8 are secured to Item 1 by: #6-32 X 5/8" HWH S	2/per Swage (Q	535-5045-00 ty. 4) (237-5976-04)
4	Coil Sleeve		545-5031-00	9 ®	Riveted Arm & Tip Assembly		515-5340-01
Roll Pi	Plunger & Link Assembly dividual Items use: Plunger 2" Lg. (530-5025-01), Plu- 1/8" $^{\circ}$ x 5/8" Lg. (251-5008-00) The Plunger Link is taining Ring, 1/4" $^{\circ}$ Shaft (Qty. 1) (270-5002-00)	1/per unger Lin	515-5338-00 k (545-5293-00) and	Arm (5	lividual Parts use (requires drilling out rivet & rere 15-5341-01), Kicker Tip (545-5216-01) and Rivet, 1/8' v. Arm is secured to Item 1 by: Retaining Ring, 1/4' ng Note: If 515-5340-01 is unavailable, order the indi	' ø x 1/4" ø Shaft (Qty. 1) (270-5002-00)
-	ng Note: If 515-5338-00 is unavailable, order the indi	vidual pa	rt(s) actually required.	This as	ng Note: If 500-5849-00 is unavailable, order the indisembly is identical to 500-5849-01 with the exception 0 (090-5044-00T) instead.		

Take Note:

- **Coil Note:** Either -00**B** or -00**T** can be used for coil replacements. B/T listed is preferable for easier diode access & may differ on game.
- "R" indicates Item noted is secured with rivet(s) as listed.



Section 4, Chapter 2



Item AP-D Note: Individual Plastics (830-6035-XX) are not available individually, ordering ▶ of kit is required. For all pieces, see Playfield Top - Plastics (Screened & Clear) Kit, Decals & Mylar Kits, Page 69.

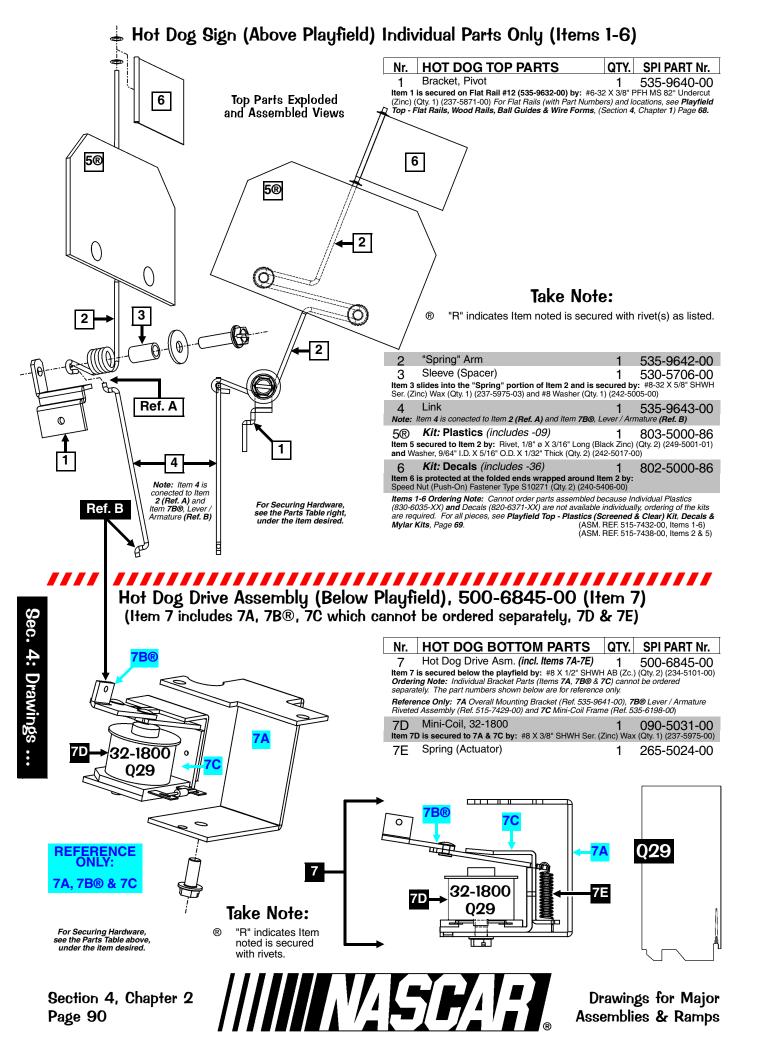
15

SPI PART Nr. Bumper (Pop) Cap (Red) Left 550-5057-02 AP-B Bumper (Pop) Cap (Clear) Right 550-5057-01 AP-C **Modified** Bumper Cap (Blue) Bottom 550-5080-05 Kit: Plastics (includes -24 & -25) 803-5000-86

Item AP-A, -B & -C are secured by: #4 X 3/4" PRH (Zinc) T-25 (Qty. 2/per) (237-5873-00) Note: Plastics -24 on AP-A (Red) and -25 on AP-C (Blue) use the same securing hardware.







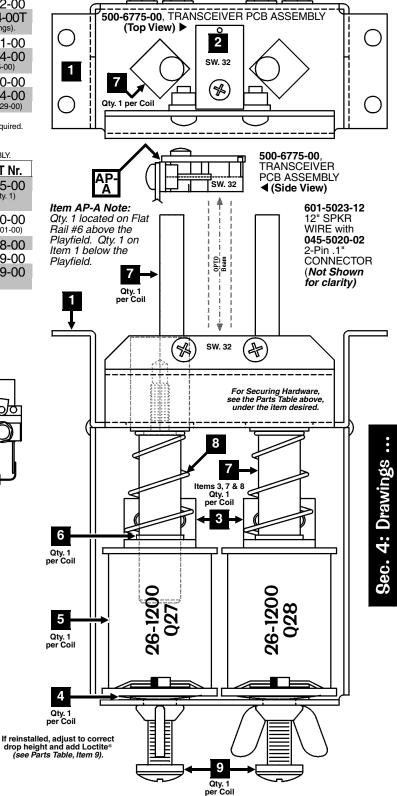
2-Post Ball Diverter Assembly, 500-6837-00 (Items 1-9) and Associated Switch Parts: See Parts Table Below.

Nr.	2-POST DIVERTER PARTS	QTY.	SPI PART Nr.					
1	Main Housing, 2-Post Mntg. Bracket	1	535-9503-00					
Item 1	is secured below the playfield by: #8 X 1/2" SHWH	AB (Zc.)) (Qty. 4) (234-5101-00)					
2 Item 2	Transceiver OPTO PCB Assembly is secured to Item 1 by: #6 X 5/16" PPH (Zinc) Type-	1 -25 (Qty.	500-6775-00 2) (237-5880-01)					
3	Coil Retaining Bracket is secured to Item 1 by: #8-32 X 1/4" SHWH Sw. (Sr	2	535-5203-03					
4	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00					
5 Each C	Coil, 26-1200 coil has a Diode (1N4004) (112-5003-00) pos. @ top (a	2 above lug	090-5044-00T gs next to windings).					
6	Coil Sleeve	2	545-5411-00					
7	Steel & Offset Extension Plunger Asm	2	515-7444-00					
Item 7 is secured to Item 1 by: Retaining Ring, 7/16" ø Shaft (Qty. 1/per) (270-5005-00)								
8	Compression (Return) Spring	2	266-5020-00					
9	Adjust. Scr. 1/4-20 X 1" SS PPHD	2	237-6164-00					
	is secured by: 1/4-20 Wing Nut (Qty. 1/per) (240-530 to 38050-380 Black Max 1oz.	∠-00) + L	Locille (000-0629-00)					

Ordering Note: If 500-6837-00 is unavailable, order the individual part(s) actually required.

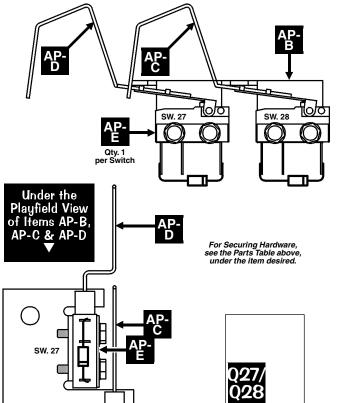
Take Note:

For a break-down of parts and wiring configuration of Items 2 and Ap-A, Transceiver OPTO PCB (500-6775-00) and associated PCBs Not Shown (Playfield OPTO Trans./Rec. Amplifier Board and Playfield X3 Triple Auxillary Board) see Section 5, Chapter 4, Printed Circuit Boards (YELLOW PAGES), Pages 148-153.

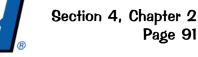


ASSOCIATED SWITCH PARTS ARE NOT INCLUDED WITH THE ASSEMBLY.

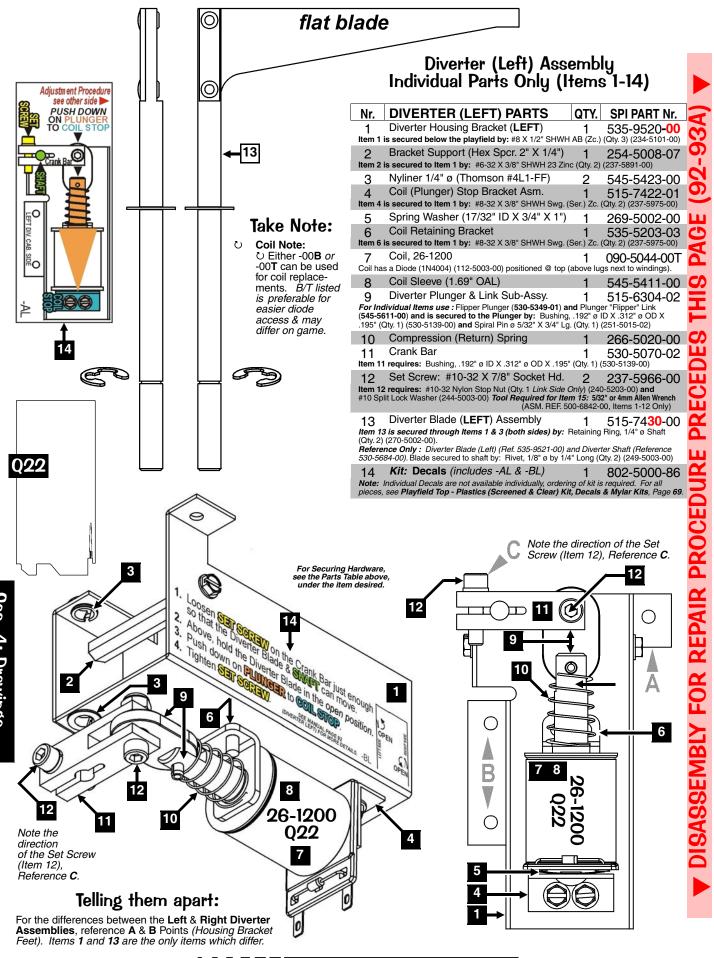
Nr.	ASSOC. SWITCH PART(S)	QTY.	SPI PART Nr.
	Transceiver OPTO PCB Assembly	1	500-6775-00
	P-A is secured on Flat Rail #6 (535-9614-00) by: Fig 45-00) and #6 X 5/16" PPH (Zinc) Type-25 (Qty. 2) (2:		
	Switch Mounting Bracket, 2-Switch P-B is secured below the P/F by: #8 X 1/2" SHWH A	1 AB (Zc.)	535-9630-00 (Qty. 2) (234-5101-00)
	Micro Switch, Straight Wire Actuator	1	180-5178-00
AP-D	Micro Sw., Med. Bend in Wire Act'tr.	1	180-5179-00
	Switch Body Protect Plate		535-6539-00
Item Al	P-E is secured by: #2-56 X 1/2" #4 HD TR3 (Qty. 2/p	er) (237-	5937-02)



Drawings for Major Assemblies & Ramps



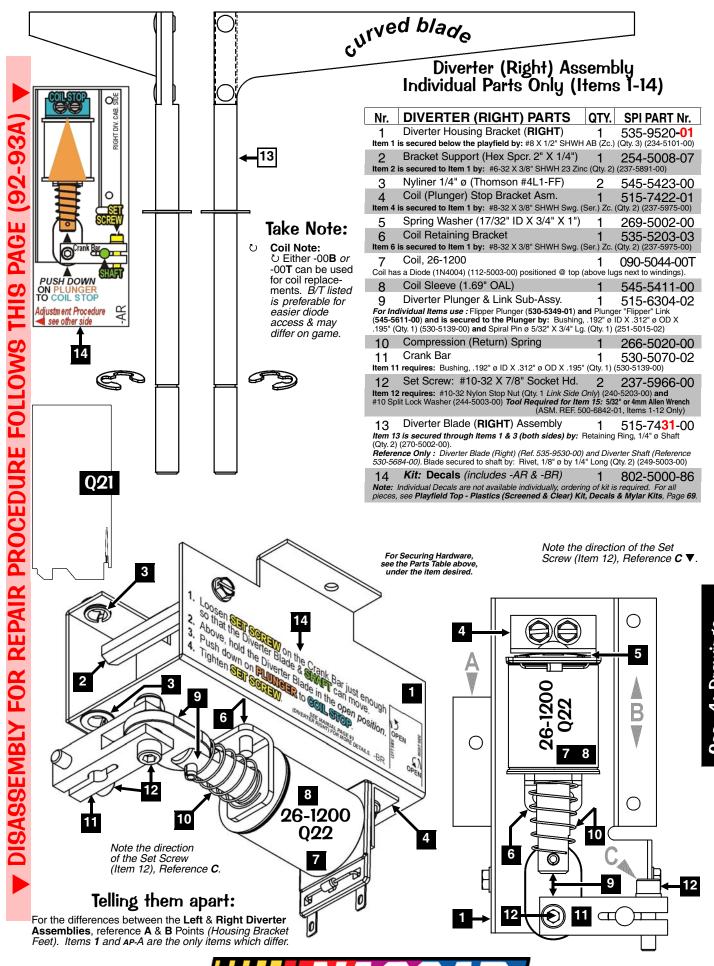
Page 91



Section 4, Chapter 2 Page 92







Drawings for Major Assemblies & Ramps



◄ Reference Pages 92-93 For Items & Part Numbers

Diverters (Left & Right) and Blades Disassembly For Repair

Technicians Remember the Basics: All Service should be done by qualified personnel. **ALWAYS REMOVE POWER BEFORE SERVICING.** Service assemblies which are below the playfield, with the playfield in its' most upright position (leaning against the Backbox). Raise it carefully! Ensure the bottom edge (back) of the playfield is still resting on the Cabinet Side Support Rails and is forward enough to allow the Playfield to lean against the backbox at an angle so it does not fall forward. **When lowering, rest on the support brackets first, then continue to place in cabinet.** Ensure playfield is pushed forward 'til the stop is felt, before lowering to ensure the Trough Popper Mechanism clears the Coin Mechanisms on the Coin Door. Re-assembly is the reverse of disassembly (removal). Keep track of securing hardware (which are referenced under the items in the Parts Table) Use **Loctite Blue 242** on the threads all screws to ensure the screws will not loosen in play.

When in doubt, give us a call!

DIVERTER BLADE (FLAG) REMOVAL:

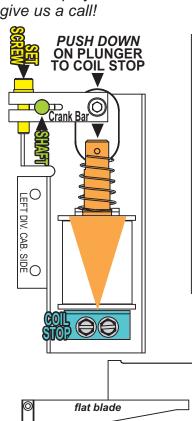
- Loosen the SET SCREW that holds the DIVERTER SHAFT & BLADE to the Crank Bar.
- 2. There are 2 Retaining Rings (clips) that hold the shaft at its correct depth to the playfield. One is located above the bracket housing, the other is located just under where the enters the bracket (Ref. Item 3 on Pages 92 or 93). Using a long nose pliers remove both of these rings from the shaft.
- 3. Remove the DIVERTER SHAFT & BLADE from the top of the playfield.

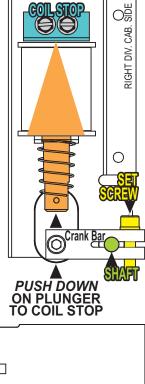
DIVETER SHAFT & BLADE ADJUSTMENT:

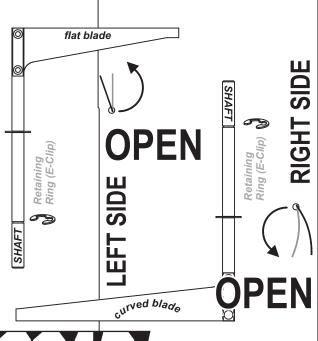
- Put a DIVERTER SHAFT & BLADE back into the bracket housing.
- 2. Reinstall both Retaing Rings onto the shaft.

>> CAUTION! Failure to install both of these rings (clips) could cause the mechanism to bind. << CAUTION!

- 3. Place the shaft end thru the Crank Bar and hand tighten the SET SCREW just enough so the Diverter Blade & SHAFT can move..
- 4. Above the playfield, hold the Diverter Blade in its' most OPEN position against the outside rail of the game. Under the playfield, push down on the plunger ALL THE WAY INTO THE COIL (AGAINST THE COIL STOP). Only then tighten the set screw onto the shaft end (through the Crank Bar). This procedure ensures correct depth of the plunger into the coil in the unenergized position. Check for smooth operation.







Section 4, Chapter 2 Pages 92-93A

Drawings for Major Assemblies & Ramps

1- & 2-Coil (Ball Accelerators) Magnets Disassembly For Repair

Technicians Remember the Basics: All Service should be done by qualified personnel. **ALWAYS REMOVE POWER BEFORE SERVICING.** Service assemblies which are below the playfield, with the playfield in its' most upright position (leaning against the Backbox). Raise it carefully! Ensure the bottom edge (back) of the playfield is still resting on the Cabinet Side Support Rails and is forward enough to allow the Playfield to lean against the backbox at an angle so it does not fall forward. **When lowering, rest on the support brackets first, then continue to place in cabinet.** Ensure playfield is pushed forward 'til the stop is felt, before lowering to ensure the Trough Popper Mechanism clears the Coin Mechanisms on the Coin Door. Re-assembly is the reverse of disassembly (removal). Keep track of securing hardware (which are referenced under the items in the Parts Table) Use **Loctite Blue 242** on the threads all screws to ensure the screws will not loosen in play.

When in doubt, give us a call!

RACE TRACK MAGNET COIL REMOVAL

Note 1: The race Track OPTO's can be serviced without removing the entire Magnet Assembly.

Note 2: Most magnet problems can be traced to Switch/OPTO problems, Fuse (F20) problem, or x3 (Triple) Driver Board problem. Always suspect these systems before replacing a driver coil (refer to Section 5). The coils are further protected by integral thermal fuses.

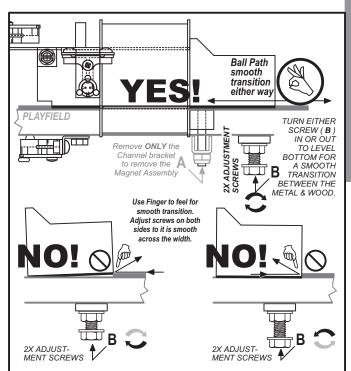
The magnet (accelerator) coils can be quick tested to see if it is firing by placing a magnetic item such as a screwdriver next to the coil. The screwdriver will move slightly if the coil is firing. Read NASCAR® Diagnostics (Portals™), Section 3, Chapter 2, Page 27. Run "Track" Test.

BOTTOM MAGNET PAIR:

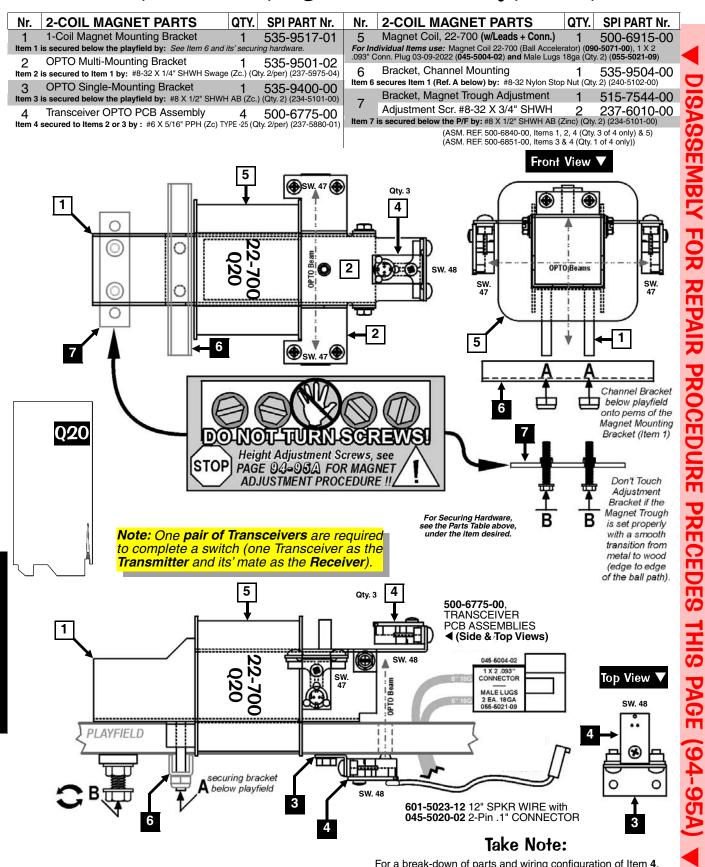
- 1. Remove the two screws holding the plastic cover to the magnets.
- 2. Raise the playfield.
- 3. Remove the under playfield plastic trough.
- 4. Disconnect the electrical connections to the magnet pair and OPTOs. Make sure to mark where they go for reassembly (they should be labeled). Both magnets have different connectors to ensure they are reconnected correctly.
- 5. Under the playfield, remove the 2 Nylon Stop Nuts holding the Channel Mounting Bracket (Ref. Item 6, Page 94 or Item 8, Page 95) which holds down the magnet assembly.
- 6. Remove the magnet assembly from the game.
- 7. After reinstallation, use the "Track" test in Portals to insure all connections are back in the correct order.

TOP MAGNET:

- In order to remove the top magnet, the ramps must be removed. See the " Left & Right Ramp Removal as a single unit ", Pages 100-102A & 100-102B.
- Under the playfield, remove the 2 Nylon Stop Nuts holding the Channel Mounting Bracket (Ref. Item 6, Page 94 or Item 8, Page 95) which holds down the magnet assembly (do not touch the screws on the Adjustment Bracket until after reassembly). Disconnect the electrical connections for the magnet and the OPTOs. Remove the Magnet assembly.
- 3. After reinstallation, use the "Track" test in Portals to insure all connections are back in the correct order.



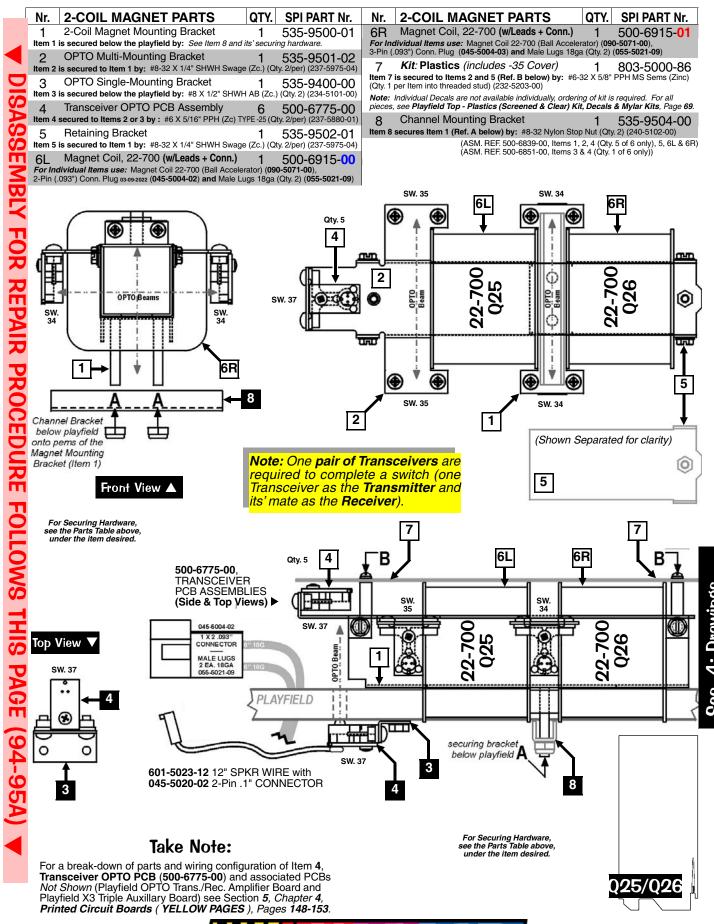
1-Coil (Ball Accelerator) Magnet Individual Parts Only (Items 1-7)



For Securing Hardware, see the Parts Table above, under the item desired. For a break-down of parts and wiring configuration of Item 4, **Transceiver OPTO PCB** (500-6775-00) and associated PCBs *Not Shown* (Playfield OPTO Trans./Rec. Amplifier Board and Playfield X3 Triple Auxillary Board) see Section 5, Chapter 4, *Printed Circuit Boards* (YELLOW PAGES), Pages 148-153.



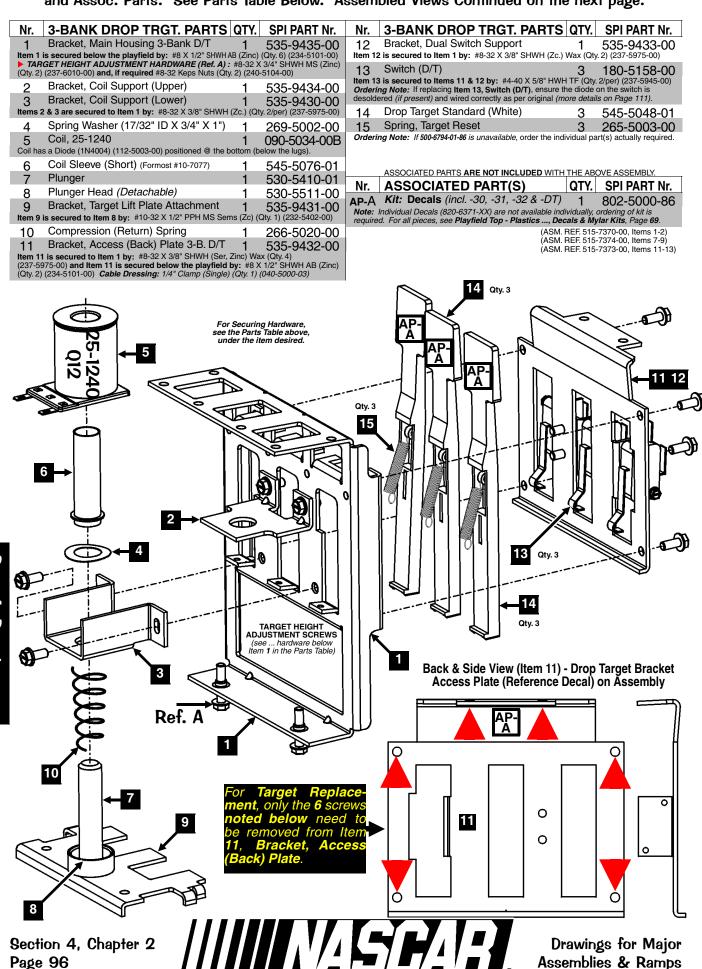
2-Coil (Ball Accelerator) Magnet Individual Parts Only (Items 1-8)



Drawings for Major Assemblies & Ramps



3-Bank Drop Target Assembly, 500-6794-01-86 (Items 1-15) and Assoc. Parts: See Parts Table Below. Assembled Views Continued on the next page.



3-Bank Drop Target
Assembly, 500-6794-01-86
(Items 1-15) Continued
Parts Table and Exploded View
on previous page.

Drop Target Height Adjustment Procedure:

With the Drop Targets (Item 14) in the DOWN POSITION, adjust the height of the Targets so the Drop Targets are "flush to slightly above" the playfield surface after replacing any target. This will ensure a BALL TRAP is not created where the ball can rest in the target hole area above the playfield.

Using a 1/4" Nut Driver and/or Flat Screw Driver and turn in or out the Screws to raise or lower the Target Lift Plate Attachment Bracket (Item 9 or Ref. A) causing the Drop Targets to reach desired height as stated above.

Item 14

AP-A Qty. 3

AP-A

Item 2

Item 3

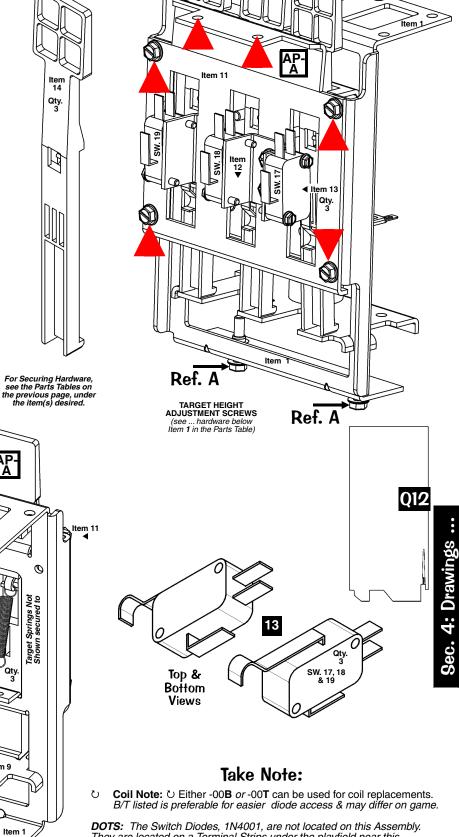
25-1**2**40

Q12

Assembled

View

Front Side



Ref. A

TARGET HEIGHT
ADJUSTMENT SCREWS
(see ... hardware below
Item 1 in the Parts Table)

Ref. A

DOTS: The Switch Diodes, 1N4001, are not located on this Assembly. They are located on a Terminal Strips under the playfield near this assembly. See Section 5, Chapter 2, Playfield Terminal Strips ..., Page 111, for more details.

Drawings for Major Assemblies & Ramps

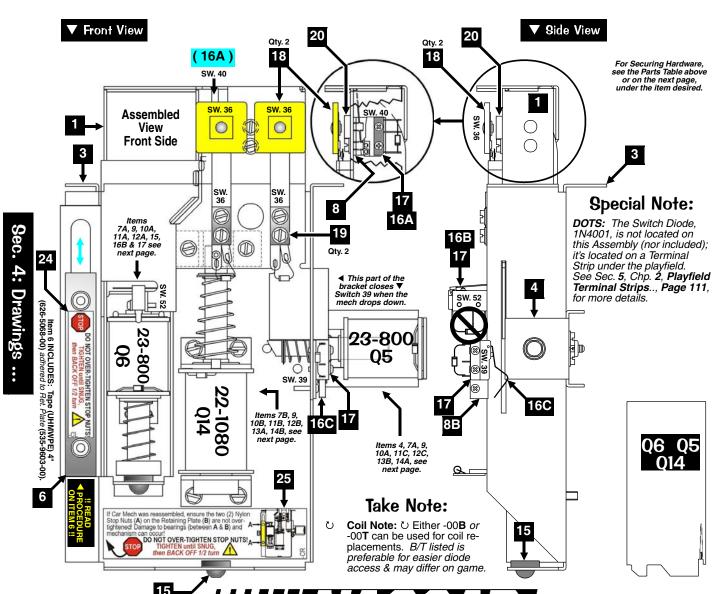


Assembled

View Back Side

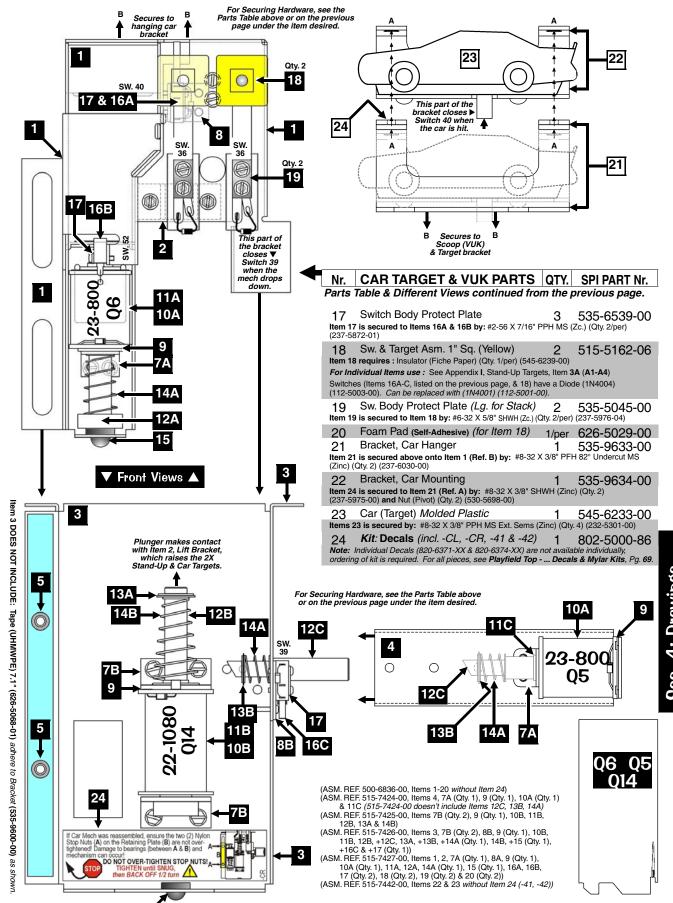
Car Target Up-Down Scoop (VUK) Individual Parts Only (Items 1-24) Parts Table & Different Views continued on the next page.

					T		
Nr.	CAR TARGET & VUK PARTS	QTY.	SPI PART Nr.	Nr.	CAR TARGET & VUK PARTS	QTY.	SPI PART Nr.
1	Bracket, Scoop (VUK) & Switch	1	535-9601-00	10A	Coil, 23-800	2	090-5001-00T
2	Bracket, Lift	1	535-9602-00	10B	Coil, 22-1080 (YEL-GRN)	1	090-5032-00T
Item 2	is secured to Item 1 by: #8-32 X 1/4" SHWH (Zinc)	(Qty. 2) (2	,		tems 10A & 10B) have a Diode (1N4004) (112-5003-0 ext to windings).	00) positio	ned @ top (above
3 Item 3	Bracket, Coil (Flipper) & Switch DOES NOT INCLUDE: Tape (UHMWPE) 7.1" (626-5)	1 068-01) a	535-9600-00 as shown	11A	Coil Sleeve (in Item 10A, Vertical)	1	545-5076-01
▶ ORD	ER ADDITIONAL (626-5068-01) IF REPLACING ITE	M 3 BR	ACKET.	11B	Coil Sleeve (with Extension)	1	545-5847-01
Items 2	& 3 are secured below the P/F: #8 X 1/2" SHWH AB	(Zc.) (Qt	ty. 7) (234-5101-00)	11C	Coil Sleeve (in Item 10C, Horizontal)	1	545-5411-00
4	Bracket, Latch is secured to Item 1 by: #8-32 X 3/8" SHWH (Zinc) (1	535-9604-00	12A	Steel Plunger Assembly	1	515-7309-00
	Bearing (Spacer) .172" ID			12B	Solid Plunger & Extension Assembly	1	515-7421-00
5 Item 5	requires: Magnalube onto Pem Studs (000-0646-00)	2	530-5695-00	12C	Plunger, SQ. Top Angle Cut (in 10C)	1	530-5686-00
6	Retaining Plate (joins 1A & 1B)	1	515-7433-00	13A Item 13	Washer (.45" ID X .75" OD X .03") (on 12B) BA is secured to Item 12B by: Retaining Ring, 7/16"	1 ø Shaft (242-5085-00 Qty. 1) (270-5005-00)
▶ REA	INCLUDES: Tape (UHMWPE) 4" (626-5068-00) adhe D INSTRUCTIONS ON ASSEMBLY REGARDING TI	GHTENII	NG OF STOP NUTS!!	13B	Washer (5/16" Square Hole) (on 12C)	1	535-9629-00
	is secured onto the Pem Studs of Item 2 by: #8-32	Nylon S	top Nut (Qty. 2)	Item 13	BB is secured to Item 12C by: Retaining Ring, 5/16	ø Shaft (Qty. 1) (270-5003-00)
(240-51	/	_	FOF FOOD 00	14A	Comp. (Return) Spring (on 12A/12C)	2	266-5020-00
7A	Coil Retaining Bracket A is secured to Items 1& 4 by: #8-32 X 1/4" SHWH (2 (Zinc) (O	535-5203-03	14B	Comp. (Return) Spring (on 12B)	1	266-5087-00
	Coil Retaining Bracket			15	Rubber Bumper (Grommet) (on 1 & 3)	2	545-5105-00
7B Item 7E	B is secured to Item 3 by: #8-32 X 3/8" SHWH (Zinc	2) (Qty. 2/ j	535-7356-00 per) (237-5975-00)	16A	Micro Sw. (1-1/4" Flat Blade Actuator)	1	180-5010-04
8A	Bracket, Switch Mntng. (for Item 16A)	1	535-9639-00	16B	Micro Sw. (VUK) Hvy. Duty (Y-Act'tor)	_1	180-5116- <u>0</u> 1
Item 8A	A is secured to Item 1 by: #8-32 X 1/4" SHWH (Zinc) (Qty. 2)			requires a Diode (1N4004) (112-5003-00) located on	a iermina	•
8B	Switch Plate (for Item 16C)	1	535-9748-00	16C	Micro Switch (Sm. + Bend Actuator)	. 1	180-5201-00
9	Spring Washer (17/32" ID X 3/4" X 1")	3	269-5002-00		Parts Table & Different Views cont	inued o	on the next page.



Section 4, Chapter 2 Page 98

Drawings for Major Assemblies & Ramps



Drawings for Major Assemblies & Ramps

DISASSEMBLY FOR REPAIR PROCEDURE FOLLOWS THIS PAGE (98-99A-B

■ Reference Pages 98-99 For Items & Part Numbers

Car Target (Garage) Up-Down Scoop Disassembly For Repair

Technicians Remember the Basics: All Service should be done by qualified personnel. **ALWAYS REMOVE POWER BEFORE SERVICING.** Service assemblies which are below the playfield, with the playfield in its' most upright position (leaning against the Backbox). Raise it carefully! Ensure the bottom edge (back) of the playfield is still resting on the Cabinet Side Support Rails and is forward enough to allow the Playfield to lean against the backbox at an angle so it does not fall forward. **When lowering, rest on the support brackets first, then continue to place in cabinet.** Ensure playfield is pushed forward 'til the stop is felt, before lowering to ensure the Trough Popper Mechanism clears the Coin Mechanisms on the Coin Door. Re-assembly is the reverse of disassembly (removal). Keep track of securing hardware (which are referenced under the items in the Parts Table) Use **Loctite Blue 242** on the threads all screws to ensure the screws will not loosen in play.

When in doubt, give us a call!

CAR HIT SWITCH (ITEM 16A, SW. 40):

If this Micro Switch needs to be completely replaced, go to **COMPLETE MECHANISM REMOVAL** (opposite this page). The easiest way to **adjust** the car hit switch is by removing the Car (Molded Plastic, Item 23). This is accomplished as follows:

- 1. Loosen and remove the two screws (Ref. A, under Item 22) holding the rocking car platform (Bracket, Car Mounting, Item 22) to the frame (Bracket, Car Hanger, Item 21). These are the two screws that are on the ends of the mounting arms. Be very careful not to misplace the 2 shoulder nuts that are located under the arm. *If necessary, the nuts may have to held with a 3/8" wrench.*
- 2. Remove the rocking platform with the car attached.
- 3. The switch is now in view under the platform awaiting adjustment.

CAR (ITEM 23) REPLACEMENT:

- 1. Loosen and remove the two screws (Ref. A, under Item 22) holding the rocking car platform (Bracket, Car Mounting, Item 22) to the frame (Bracket, Car Hanger, Item 21). These are the two screws that are on the ends of the mounting arms. Be very careful not to misplace the 2 shoulder nuts that are located under the arm. If necessary, the nuts may have to held with a 3/8" wrench.
- 2. Remove the rocking platform with the car attached.
- 3. On the underside of the carriage, there are 4 screws holding the car (Item 23) to the platform. Remove the screws.

The following three (3) coils can be replaced without removing the entire mechanism.

UP / DOWN COIL (Item 10) REPLACEMENT:

- 1. Unsolder the 2 wires attached to the coil (Item 10B). Note which wire goes to which lug.
- 2. There are 2/per screws securing the Coil Retaining Brackets (Item 7B) which secure the Coil and Plunger (Item 12B) to the mechanism (Item 3). Remove the screws and brackets.
- 3. Remove the Coil and Plunger. Note the position of the Spring Washer (Item 9).
- 4. Use a long nose plier to remove the Retaining Ring (Ref. under Item 13A) from the end of the Plunger.
- 5. Remove the Washer (Item 13A) and Spring (Item 14B) from the end of the Plunger. *Note the that the spring goes on the plunger with the large side towards the coil.*
- 6. Remove the Plunger from the coil.
- 9. Reassemble components on new coil. Use a new Coil Sleeve (Item 11B), if necessary.

continued next page.



■ Reference Pages 98-99 For Items & Part Numbers

Car Target Up-Down Scoop Disassembly For Repair Continued

The following coils can be replaced without removing the entire mechanism.

LATCH COIL (ITEM 10A, HORIZONTAL) REPLACEMENT:

- 1. Unsolder the 2 wires attached to the coil (Item 10A). Note which wire goes to which lug.
- 2. There are 2 screws securing the Coil Retaining Bracket (Item 7A) which secure the Coil and Plunger (Item 12C) to the mechanism (Item 3). Remove the screws and bracket.
- 3. Remove the Coil and Plunger. Note the position of the Spring Washer (Item 9).
- 4. Use a long nose plier to remove the Retaining Ring (Ref. under Item 13B) from the end of the Plunger.
- 5. Remove the Washer (Item 13B) and Spring (Item 14A) from the end of the Plunger. *Note the that the spring goes on the plunger with the large side towards the coil.*
- 6. Remove the Plunger from the coil.
- 7. Reassemble components on new coil. Use a new Coil Sleeve (Item 11C), if necessary.

SCOOP (VUK or POPPER) COIL (ITEM 10A, VERTICAL) REPLACEMENT:

- 1. Unsolder the 2 wires attached to the coil (Item 10A). Note which wire goes to which lug.
- 2. There are 2 screws securing the Coil Retaining Bracket (Item 7A) which secure the Coil and Plunger (Item 12A) to the mechanism (Item 3). Remove the screws.
- 3. Remove the Coil and Plunger. Note the position of the Spring Washer (Item 9).
- 4. Remove the Spring (Item 14A) from the end of the Plunger. *Note the that the spring goes on the plunger with the large side towards the coil.*
- 6. Remove the Plunger from the coil..
- 7. Reassemble components on new coil. Use a new Coil Sleeve (Item 11B), if necessary.

COMPLETE MECHANISM REMOVAL:

- 1. Remove the Car platform as outlined in **CAR REPLACEMENT** (opposite page).
- 2. Under the playfield, disconnect the 2 cable connectors that attach to the mechanisms electronics (coils and switch wiring).
- 3. Remove the 5 screws (Ref. under Item 1) that attach the mechanism to the playfield. Because of the weight of the mechanism, 2 of these screws go into T-Nuts on the top of the playfield. Be carefull on reassembly to note where these two screws go.
- 4. Remove the mechanism from the playfield.

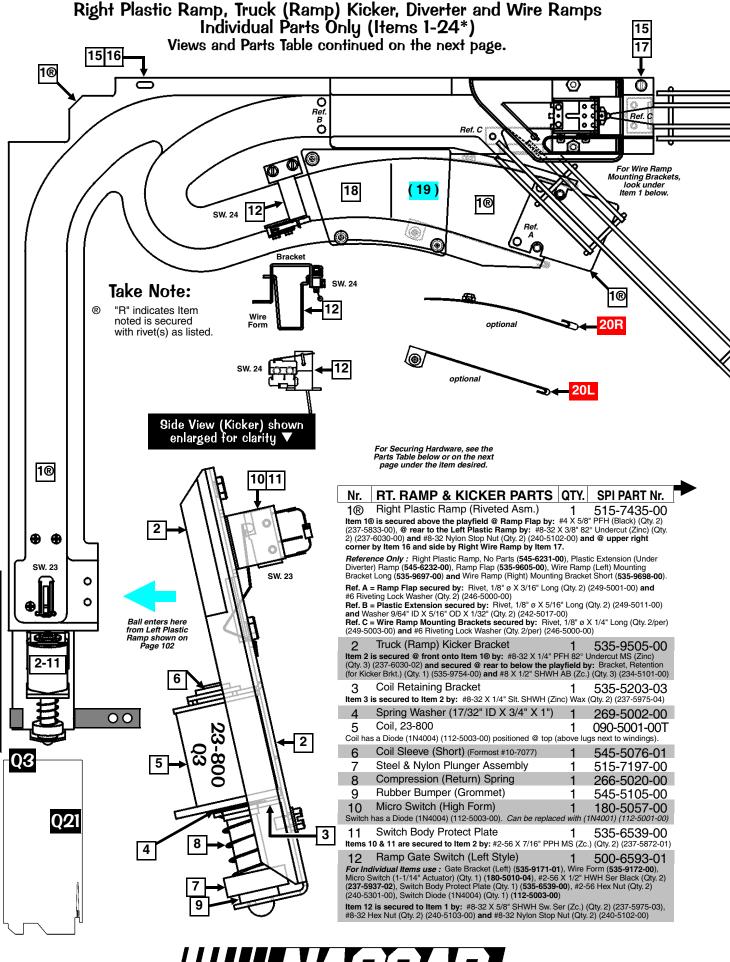
SLIDING STRUCTURE REMOVAL AND ADJUSTMENT:

- 1. Remove the complete mechanism from the game as outlined above.
- 2. Remove the two Nylon Stop Nuts (Ref. under Item 6) from the left top side of the slider bar.
- 3. Remove the Retaining Plate (Item 6).
- 4. Remove the two bushings (bearings) (Item 5) that are in the slider channels of the Scoop (VUK) Bracket (Item 1).
- 5. Remove the entire slider plate mechanism.

Special Note >> TECH ALERT! << on re-assembly:

- 5R. Place the slider plate back in its retaining groove on the right side and over the two locking studs on the left side (Ref. view of Item 5).
- 4R. Place a small amount of magnalube or other light teflon grease on the centers and perimeter of the bushings (bearings). Place them in the channels.
- 3R. Put the Retaining Plate (Item 6) in place.
- 2R. Put on the two Nylon Stop Nuts. Tighten until they just bottom the plate on the bushings >> THEN BACK OFF THE NUTS 1/2 TURN. This clearance is VITAL to ensure the bushings rotate freely!
- 1R. Reinstall mechanism on game.





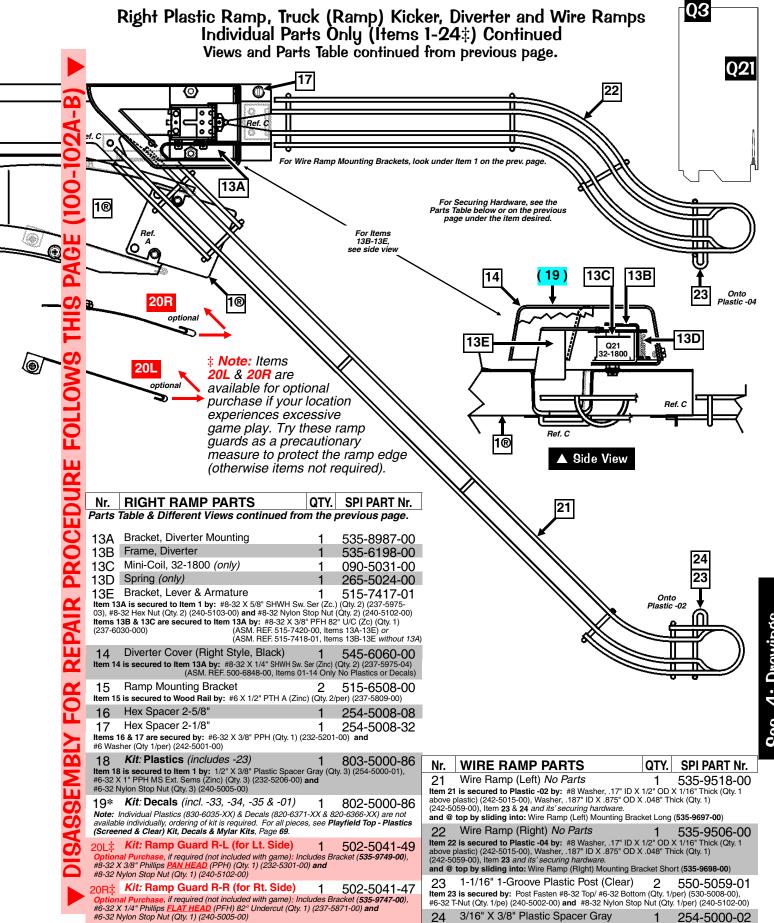
Section 4, Chapter 2 Page 100

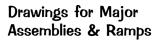
Sec. 4: Drawings ...



Drawings for Major Assemblies & Ramps









3/16" X 3/8" Plastic Spacer Gray

254-5000-02

2-X ▼

Sec. 4: Drawings ...

Section 4, Chapter 2

Pages 100-102A

Technicians Remember the Basics: All Service should be done by qualified personnel. ALWAYS REMOVE POWER BEFORE SERVICING. Service assemblies which are above the playfield, with the playfield resting on the Support Slide Brackets (inclined lower position). When lowering, ensure playfield is pushed forward 'til the stop is felt, before lowering to ensure the Trough Popper Mechanism clears the Coin Mechanisms on the Coin Door. Re-assembly is the reverse of disassembly (removal). Keep track of securing hardware (which are

referenced under the items in the Parts Table) Use Loctite Blue 242 on the threads all screws to ensure the screws will not loosen in play. RIGHT RAMP **DIVERTER** (**(** When in doubt, give us a call! THE TWO PLASTIC RAMPS ARE REMOVED AS A SINGLE UNIT: 1. Remove the two (2) #4 Phillips Flat Head Black Screws at the entrance of **EACH** ramp (by the Steel Ramp Flaps, Ref. under Item 1®) or reference the **1-X** on the drawing. 2. Remove the entire Back Panel Assembly (see BACK PANEL (ITEM 1) ASSEMBLY REMOVAL:, Pages 103B). Reference the 2-X on the drawing. 3. Remove the Nylon Stop Nuts at the Wire Ramp Exits over the Slingshot Plastic Covers (Ref. Item 23, Page 101) or reference the 3-X on the drawing. 4. Remove the #6-32 X 3/8" Phillips Pan Head screws from each Hex Spacer supporting the sides of EACH ramp (Ref. under Items 16 & 17, Page 101 and under Items 11 & 12, Page 102) or reference the 4-X on the drawing. 0 0 **RIGHT** LEFT **RAMP** RAMP PIT continued next page. **ENTRANCE** COIL & AMP SIGN **SWITCH**

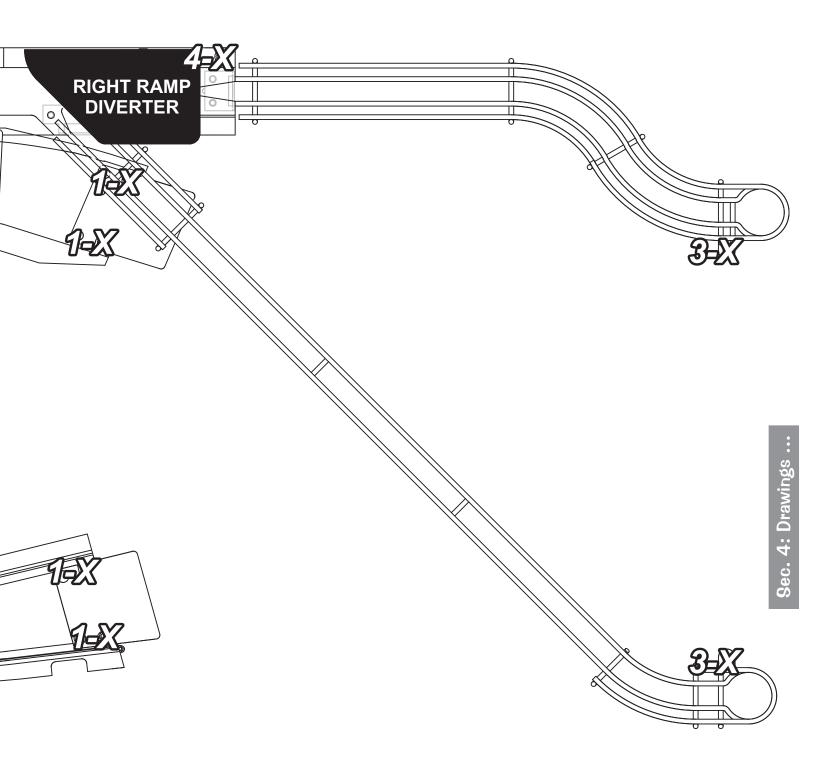
Drawings for Major

Assemblies & Ramps

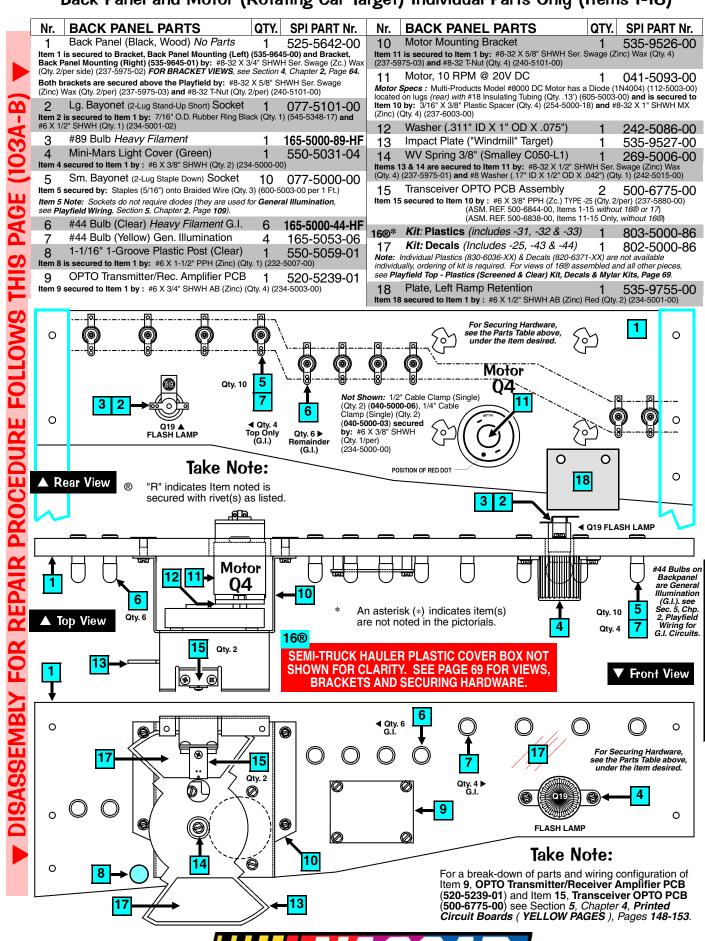
■ Reference Pages 100-101 or Page 102 ► For Items & Part Numbers

Left & Right Ramp Removal as a single unit Continued

- 5. Unplug the electrical connector for the rear of the Right Ramp Coil & Switch assembly.
- 6. Unplug the electrical connector for the Right Ramp Diverter assembly.
- 7. Unplug the electrical connector for the Left Ramp Pit Entrance Lamp Sign.
- 8. Remove the entire Plastic (Left & Right) Ramp and Wire Ramps from the game as one unit.







Drawings for Major Assemblies & Ramps



■ Reference Page 103 For Items & Part Numbers

Rotating Wheel Target & Back Panel Disassembly For Repair

Technicians Remember the Basics: All Service should be done by qualified personnel. **ALWAYS REMOVE POWER BEFORE SERVICING.** Service assemblies which are above the playfield, with the playfield resting on the Support Slide Brackets (inclined lower position). When lowering, ensure playfield is pushed forward 'til the stop is felt, before lowering to ensure the Trough Popper Mechanism clears the Coin Mechanisms on the Coin Door. Re-assembly is the reverse of disassembly (removal). Keep track of securing hardware (which are referenced under the items in the Parts Table) Use **Loctite Blue 242** on the threads all screws to ensure the screws will not loosen in play.

When in doubt, give us a call!

COMPLETE MOTOR (ITEMS 11-15) ASSEMBLY REMOVAL:

- 1. Remove the two (2) front Hex Washer Head screws that hold the Screened Plastic (Semi-Truck) Hauler facade (not shown) to the Main Motor Mounting Bracket (Item 10) or reference the **X**s on the next page drawing.
- 2. Unclip the wires that are held to the backside of the facade (behind/inside) from the Ramp OPTOs.
- 3. Lay the facade as much out of the way as possible.
- 4. Remove the two (2) OPTO Connectors from the motor OPTOs at the OPTO Board on the Front of the Back Panel. *Note the decals reference which Connector to reconnect to.*
- 5. Disconnect the motor power connector (located behind the Back Panel near the motor).
- 6. Remove the four (4) screws (Ref. under Item 10) that secures the Motor Mounting Bracket (Item 10) to the Back Panel.
- 7. Remove the entire assembly from the game for servicing.

REMOVE WHEEL (IMPACT PLATE, ITEM 13) FROM THE MOTOR ASSEMBLY:

- 1. Remove the two (2) front Hex Washer Head screws that hold the Screened Plastic (Semi-Truck) Hauler facade (not shown) to the Main Motor Mounting Bracket (Item 10) or reference the **X**s on the next page drawing.
- 2. Unclip the wires that are held to the backside of the facade (behind/inside) from the Ramp OPTOs.
- 3. Lay the facade as much out of the way as possible.
- 4. Remove the two (2) screws that hold the front motor OPTO (Ref. Item 15) in place and set the OPTO aside.
- 5. Remove the screw that holds the wheel (Impact Plate, Item 13) to the motor (center, Ref. Item 14).
 - >> CAUTION! Make sure to KEEP the Washer (Ref. under Item 14) which retains the Wave Washer (WV Spring, Item 14) that are just under the screw. << CAUTION!

THE WAVE WASHER SPRING is a SAFETY ITEM that ensures that the Impact Plate will slip in the event it makes contact with any solid object while the motor is turning.

6. Remove the Wheel (Impact Plate).

REMOVE THE MOTOR & GEAR BOX FROM THE MOTOR MOUNTING BRACKET:

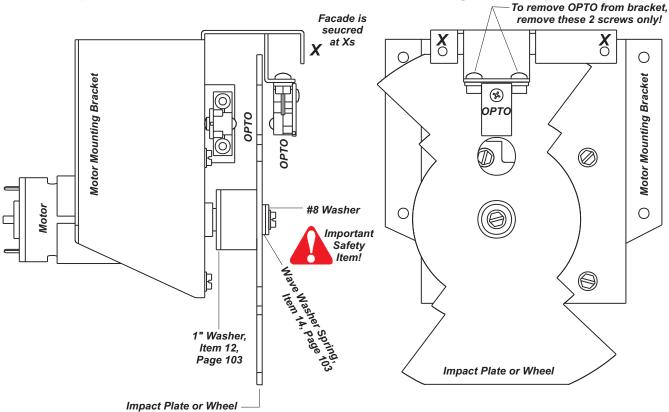
- 1. Follow COMPLETE MOTOR (ITEMS 11-15) ASSEMBLY REMOVAL: above.
- 2. Note the four (4) spacers between the Motor Gear box on the inside of the Motor Mounting Bracket. These spacers are what position the Impact Plate (wheel) to clear the open space in the Left Ramp. As parts may differ in future productions, these spacers may not exist. Rule of thumb, replace the same items you remove into the same position.

continued next page.



■ Reference Page 103 For Items & Part Numbers

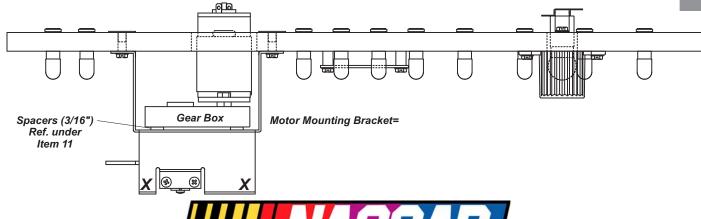
Rotating Wheel ... & Back Panel Disassembly For Repair Cont.



THE WAVE WASHER SPRING is a SAFETY ITEM that ensures that the Impact Plate will slip in the event it makes contact with any solid object while the motor is turning.

BACK PANEL (ITEM 1) ASSEMBLY REMOVAL:

- 1. Remove the two (2) front Hex Washer Head screws that hold the Screened Plastic (Semi-Truck) Hauler facade to the Main Motor Mounting Bracket (Item 10) or reference the **X**s.
- 2. Unclip the wires that are held to the backside of the facade (behind/inside) from the Ramp OPTOs.
- 3. Lay the facade as much out of the way as possible.
- 4. Remove the two (2) OPTO Connectors from the motor OPTOs at the OPTO Board on the Front of the Back Panel. *Note the decals reference which Connector to reconnect to.*
- 5. Reach behind the Back Panel and unplug the main Back Panel electrical connector from its' Z-Header. At the same time, unplug the main Back Panel Switch connector.
- 6. Remove the four (4) screws that hold the Back Panel to its' Support Brackets (Ref. under Item 1) and remove the entire assembly from the game.



Drawings for Major Assemblies & Ramps

Ball Deflector Assemblies, 500-5788-02 Up/Down Post Assy., 500-6293-00 (Qty. 2) (Items 1-8) (Items 1-9)

Nr.	BALL DEFLECTOR PARTS	QTY.	SPI PART Nr.
1	Ball Deflector Coil Mounting Bracket	1	535-6857-02
item i	is secured below the playfield by: #8 X 1/2" SHWH	AB (ZC.)	(Qty. 4) (234-5101-00)
2	Coil Retaining Bracket	1	535-5203-03
Item 2	is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (C	(23 (23) (23	32-5300-00)
3	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
4	Coil, 26-1200	1	090-5044-00T
Coil has	s a Diode (1N4004) (112-5003-00) positioned @ top (a	above lu	gs next to windings).
5	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01
6	Steel & Nylon Plunger Assembly	1	515-6858-00
7	Compression (Relay) Spring	1	266-5022-01
. 8	#10-32 Adj. Spindle Stop w/Rubber Tip	_ 1	280-5014-00
Item 8	is secured by: #10-32 Keps Nut (Qty. 1) (240-5208-0	0)	

Ordering Note: If 500-5788-02 is unavailable, order the individual part(s) actually required.

AUX AUX 3

Sec. 4: Drawings ...

Coil Note: ひ Either -00B or -00T can be used for coil replacements. B/T listed is preferable for easier diode access and may differ on game.

Take Note:

Top View

Section 4, Chapter 2

Page 104

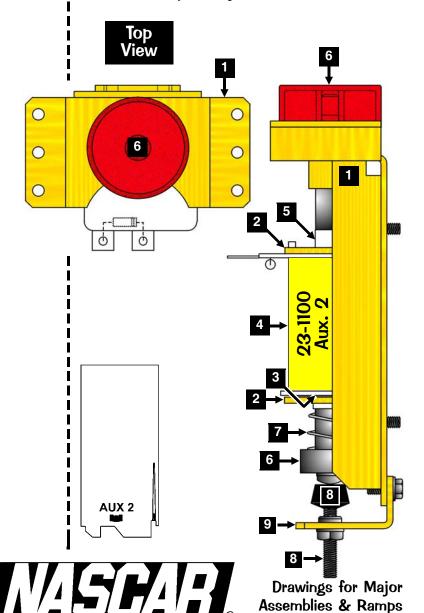
Nr.	UP/DOWN POST PARTS	QTY.	SPI PART Nr.				
1 Item 1	Up/Down Post Coil Mounting Bracket is secured below the playfield by: #8 X 1/2" SHWH	1 AB (Zc.	515-6840-00) (Qty. 6) (234-5101-00)				
2 Items 2	Coil Retaining Bracket & 3 are secured by: #8-32 X 3/8" Swage (Serr) Zince	2 c (Qty. 2/	535-7356-00 per) (237-5975-00)				
3	Spring Washer, 17/32" ID X 3/4" X 1"	1	269-5002-00				
4 Coil has	Coil, 23-1100 (ORG) s a Diode (1N4004) (112-5003-00) positioned @ top (a	1 above lu	090-5030-00T gs next to windings).				
5	Coil Sleeve (with extension)	1	545-5847-00				
Only (5 (Sems) (251-50	Ball Bumper, Plunger & Shaft Assy. lividual Items use: Ball Bumper Plastic (Top) Red (5: 15-6841-00), Plunger Head (detachable) (530-551-00), Zinc (secures Plunger Head to Shaft) (232-5401-00), 02-00) and Retaining Ring, 1/4" ø Shaft (270-5002-00)	0), #10-3 Roll Pin 0)	32 X 3/8" PPH MS 3/32" ø x 1/2" Long				
Ordering Note: If 515-6844-00 is unavailable, order the individual part(s) actually required.							

Compression (Relay) Spring 266-5022-01 #10-32 Adj. Spindle Stop w/Rubber Tip 280-5014-00 8 Item 9 is secured by: #10-32 Keps Nut (Qty. 1) (240-5208-00)

Adjustment Spindle Stop Bracket 535-8303-00 Ordering Note: If 500-6293-00 is unavailable, order the individual part(s) actually require

Take Note:

Coil Note: ひ Either -00B or -00T can be used for coil replacements. B/T listed is preferable for easier diode access and may differ on game.



Schematics, Wiring & PCBs

Table of Contents

V		V V
Chap	pter 1, Backbox Wiring	106
Ī	COILS DETAILED CHART TABLE	106
	Backbox I/O Power Driver Board Detailed Wiring Diagram	
	Backbox Board Layout Wiring Diagram	108
• Char	pter 2, Playfield Wiring	
	General Illumination Circuit Detailed Wiring Diagram	
ĺ	Playfield Switch Wiring Diagram & Playfield Lamp Wiring Diagram	
:	Playfield Terminal Strips, Fuses & Misc. Wiring Descriptions & Locations	
ĺ	2-Flipper Circuit Wiring Diagram	
	pter 3, Cabinet Wiring	
1	Transformer Power Wiring Diagram	
İ	Cabinet / Coin Door Wiring Diagram	
	pter 4, Printed Circuit Boards (PCBs)	
, O	Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic	
	Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic	
ļ	OPTO Troubleshooting	
ļ	☐ Trough Dual OPTO Boards Alignment / Tests for LED1 & LED2	
- •	Dot Matrix Display / Display Controller Bd. Combined Display Connections	
files e only, (further in save	Display Power Supply Board Schematic, Component Layout & Parts	
these websit tic set i you ce	Display Controller Board Schematic	120-121
ting as in the shema	Display Controller Board Component Layout & Parts	122
o open o open n the sc , where	I/O Power Driver Board Theory of Operation	123
play con. Ke on. Ke solow to sheet in ddress	I/O Power Driver Board Schematic (Sheet 1 of 5 — 5 of 5)	
yy, Dis operati may be nother (I/O Power Driver Board Component Layout	
They I	I/O Power Driver Board Parts	
/ Fower and the uired). rect yo sent to	CPU/Sound Board II (with ATMEL Processor) Theory of Operation	
Alspinay ayout a Jer red may di will be:	CPU/Sound Board II (with ATMEL Processor) Schematic (Sheet 1 of 4 — 4 of 4)	
or the population of the popul	CPU/Sound Board II (with ATMEL Processor) Component Layout	
Adobe(re addi by eMi	Playfield Switches OPTO Transceiver Bd. Schematic, Component Layout & Parts	
> 2/r- ind the ind the ind the xmat (, xs whe "Page	Playfield OPTO Transmitter / Receiver Amplifier Board Schematic	
Spiro you'il f PDF FC mallin 'Send"	P/F OPTO Transmitter / Receiver Amplifier Board Component Layout & Parts	(Top) 149
ncs (or matics are in I ze inter "Elle" :	P/F OPTO Transmitter / Receiver Amplifier Board Wiring Configuration #1	(Bot) 149
www.starninala.com/stenenates.hm to the aleast 11.7 x1.7 cohematis (or 'speed EduCound Beards (White Starn's) system Only). Along with the schematis yo continuously improved with more 'speedr' links in the documents. The files are in PID more on your harddrive hey!! open fast. Inside the schematics you can utilize intend uddone within documents). To 'download" once open, in your browser click "Elie" 'Sgel file to your hardrive.	P/F OPTO Transmitter / Receiver Amplifier Board Wiring Configuration #2	\ I /
with the outs. The syon control of syon contro	P/F OPTO Transmitter / Receiver Amplifier Board Wiring Configuration #3	, ,
Along Scumer Smattics n your	P/F OPTO Transmitter / Receiver Amplifier Board Wiring Configuration #4	\ '
a ratest Only). I the do I e sche open, i	P/F OPTO Transmitter / Receiver Amplifier Board Wiring Configuration #5	
ystem ystem links ir nside th	Playfield X3 (<i>Triple</i>) Driver Board Schematic	152 152
tar™ S tar™ S earch " fast. Ir vnload	UK & Special App. 3X Transistor Driver Bd. Schematic & Component Layout	
Vhite S Nore "s I open Fo "dov	UK 3X Transistor Driver Bd. Schematic & Component Layout	
ants).	UK 3X Trans. Driver Board with the Tournament Serial Interface (TSI) Board	
Dall. C. nd Bos proved arddriv focume frive.	Aux. 3X Trans. Driver Board with the TSI Board and Ticket Interface	
J/Sour J/Sour J/Sour J/Sour h/S J/Sour h/Sour h/S J/Sour h/Sour h/S J/Sour h/Sour h/S J/Sour h/Sour h/Sour h/Sour h/S J/Sour h/Sour	☐ Tournament Serial Interface Board Schematic (Sheet 1 of 1)	
ww.sw & CPI intinuor coe on stions v ctions v	Tournament Serial Interface Board Component Layout	
5 5 8 5 5 2 2 3 €	'	Į.

All 11 X 17 Schematics and other PDF files are also available on CD-ROM.

Schematics, Wiring & PCBs



COILS DETAILED CHART TABLE

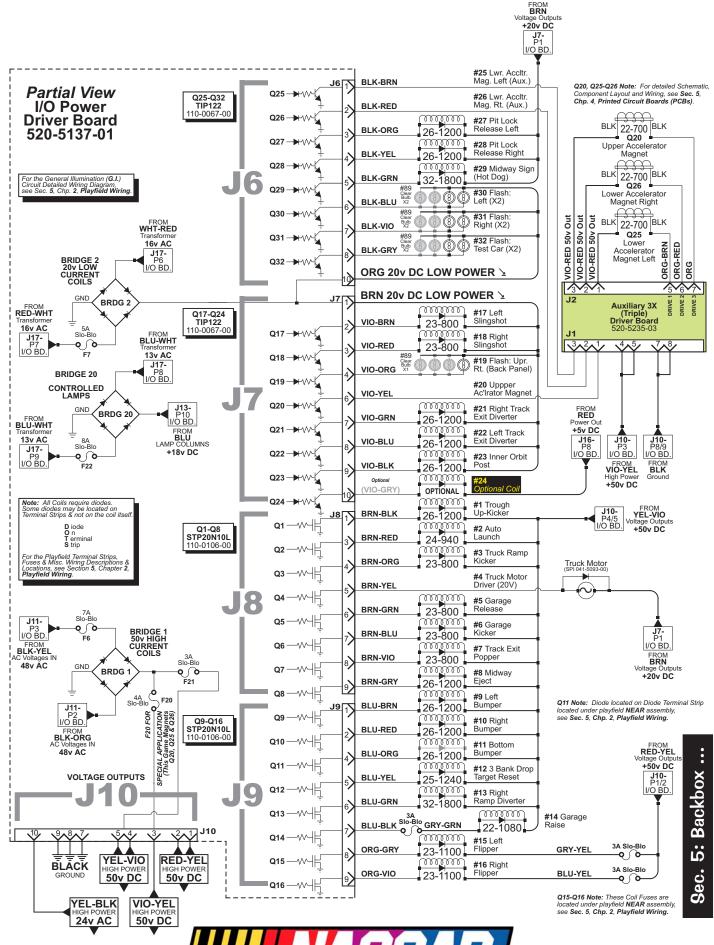
	High Owners Locale Organia	Drive	Driver	PowerLine	Power Line	Power	Drive Transistor	D.T. Control	Coil GA-Turn
,, .		ansistor	Ouput Board	Color	Connection	Voltage	Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type 26-1200 🖰
#1	TROUGH UP-KICKER	Q1		YEL-VIO	J10-P4/5	50v DC	BRN-BLK	J8-P1	090-5044-00T 24-940 U
#2	AUTO LAUNCH	Q2	A	YEL-VIO	J10-P4/5	50 _v DC	BRN-RED	J8-P3	090-5036-00B
#3	TRUCK RAMP KICKER	Q3	1/0	YEL-VIO	J10-P4/5	50 _v DC	BRN-ORG	J8-P4	23-800 U 090-5001-00B
#4	TRUCK MOTOR DRIVE (20V)	Q4	I/O Power	BROWN	J7-P1	20 _v DC	BRN-YEL	J8-P5	Motor 20v 041-5093-00
#5	GARAGE RELEASE	Q5	Driver	YEL-VIO	J10-P4/5	50 _v DC	BRN-GRN	J8-P6	23-800 U 090-5001-00T
#6	GARAGE KICKER	Q6	•	YEL-VIO	J10-P4/5	50 _v DC	BRN-BLU	J8-P7	23-800 U 090-5001-00T
#7	TRACK EXIT POPPER	Q7	·	YEL-VIO	J10-P4/5	50 _v DC	BRN-VIO	J8-P8	23-800 U 090-5001-00T
#8	MIDWAY EJECT	Q8		YEL-VIO	J10-P4/5	50 _v DC	BRN-GRY	J8-P9	26-1200 O
	High Current Coils Group 2	Drive	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#9	LEFT BUMPER	Q9		YEL-VIO	J10-P4/5	50 _v DC	BLU-BRN	J9-P1	26-1200 O
#10	RIGHT BUMPER	Q10		YEL-VIO	J10-P4/5	50v DC	BLU-RED	J9-P2	26-1200 O
#11	BOTTOM BUMPER	Q11	A	YEL-VIO	J10-P4/5	50v DC	BLU-ORG	J9-P4	26-1200 O
#12	3 BANK DROP TARGET RESET	Q12	_ I/O	YEL-VIO	J10-P4/5	50 _v DC	BLU-YEL	J9-P5	25-1240 U 090-5034-00B
#13	RIGHT RAMP DIVERTER	Q13	Power Driver	YEL-VIO	J10-P4/5	50 _v DC	BLU-GRN	J9-P6	32-1800 U 090-5031-00
#14	GARAGE RAISE	Q14	_	YEL-VIO	J10-P4/5	50 _v DC	GRY-GRN~3A Fuse~BLU-BLK	J9-P7	22-1080 U 090-5032-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	•	GRY-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-GRY	J9-P8	23-1100 U 090-5030-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16		BLU-YEL~3A	J10-P1/2	50v DC	ORG-VIO	J9-P9	23-1100 ర
	Fuse~ncD-1cL								
	·	Drive ensistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#17	LEFT SLINGSHOT	Q17		BROWN	J7-P1	20 _v DC	VIO-BRN	J7-P2	23-800 U 090-5001-00T
#18	RIGHT SLINGSHOT	Q18	•	BROWN	J7-P1	20 _v DC	VIO-RED	J7-P3	23-800 U 090-5001-00T
#19	FLASH: UPR RIGHT (BACK PNL)	Q19		ORANGE	J6-P10	20 _v DC	VIO-ORG	J7-P4	#89 Bulb 165-5000-89
#20	UPR ACCELERATOR MAG (AUX)	Q20	I/O Power	VIO-RED~Triple Aux~VIO-YEL	J2-P3~Triple Aux~J10-P3	<u>50v DC</u>	ORG~Triple Aux~VIO-YEL	J2-P7~Trp. Aux~J7-P6	22-700 U 090-5071-00
#21	RIGHT TRACK EXIT DIVERTER	Q21	Driver	BROWN	J7-P1	20 _v DC	VIO-GRN	J7-P7	26-1200 O 090-5044-00T
#22	LEFT TRACK EXIT DIVERTER	Q22	_	BROWN	J7-P1	20 _v DC	VIO-BLU	J7-P8	26-1200 O 090-5044-00T
#23	INNER ORBIT POST	Q23	,	BROWN	J7-P1	20 _v DC	VIO-BLK	J7-P9	26-1200 O
#24	OPTIONAL COIL	Q24		RED	J16-P7	5v DC	VIO-GRY	J7-P10	Opt. 5v
	Diode On Terminal Strip (if noted) Low Current Coils Group 2 Tra	Drive	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control	Coil GA-Turn or Bulb Type
#25	LWR ACCLRTR MAG LT (AUX)	unsistor Q25	Ouput Board	VIO-RED~Triple	IO D4 Tulula		ORG-BRN~Triple	J2-P5~Triple	22-700
#26	LWR ACCLRTR MAG RT (AUX)	Q26		Aux~VIO-YEL VIO-RED~Triple	Aux~J10-P3 J2-P2~Triple Aux~J10-P3	50v DC	Aux~BLK-BRN ORG-RED~Triple	J2-P6~Triple	
#27	PIT LOCK RELEASE LEFT	Q27	A	Aux~VIO-YEL BROWN	J7-P1	20 _v DC	Aux~BLK-RED BLK-ORG	J6-P3	090-5071-00 26-1200 U
#28	PIT LOCK RELEASE RIGHT	Q28	I/O	BROWN	J7-P1	20v DC	BLK-YEL	J6-P4	090-5044-00T 26-1200 ひ
#29	MIDWAY SIGN (HOT DOG)	Q29	Power	BROWN	J7-P1	20v DC	BLK-GRN	J6-P5	090-5044-00T 32-1800 ℃
#30	FLASH: LEFT (X3)	Q30	Driver	ORANGE	J6-P10	20v DC	BLK-BLU	J6-P6	090-5031-00 #89 Bulb
#31	FLASH: RIGHT (X3)	Q31	▼	ORANGE	J6-P10	20v DC	BLK-VIO	J6-P7	165-5000-89 #89 Bulb
	` ,	Q32				20v DC			165-5000-89 #89 Bulb
#32	FLASH: TEST CAR (X2) Note: In Test Flash Lamps Menu ("Fl		on), Flashers te		J6-P10 amps located b	etween Q	BLK-GRY 1-Q32 (This Game:	J6-P8 Q19, Q30-Q3	165-5000-89
		Drive ansistor		Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn
	AUX 1: LEFT UP/DOWN POST	Q1	UK 3X	BROWN	J7-P1	20v DC	WHITE	J2-P3	26-1200 O 090-5044-00T
	AUX 2: CENTER UP/DOWN POST	Q2	Trans. Driver	BROWN	J7-P1	20v DC	RED	J2-P4	23-1100 O
	AUX 3: RIGHT UP/DOWN POST	Q3	Board	BROWN	J7-P1	20 _v DC	ORANGE	J2-P7	26-1200 O
ბ Cc	oil Note: ひ Either -00B or -00T can be use	ed for o	coil replacem	nents. B/T listed	is preferable	for eas	ier diode access	& may diffe	

Section 5, Chapter 1 Page 106

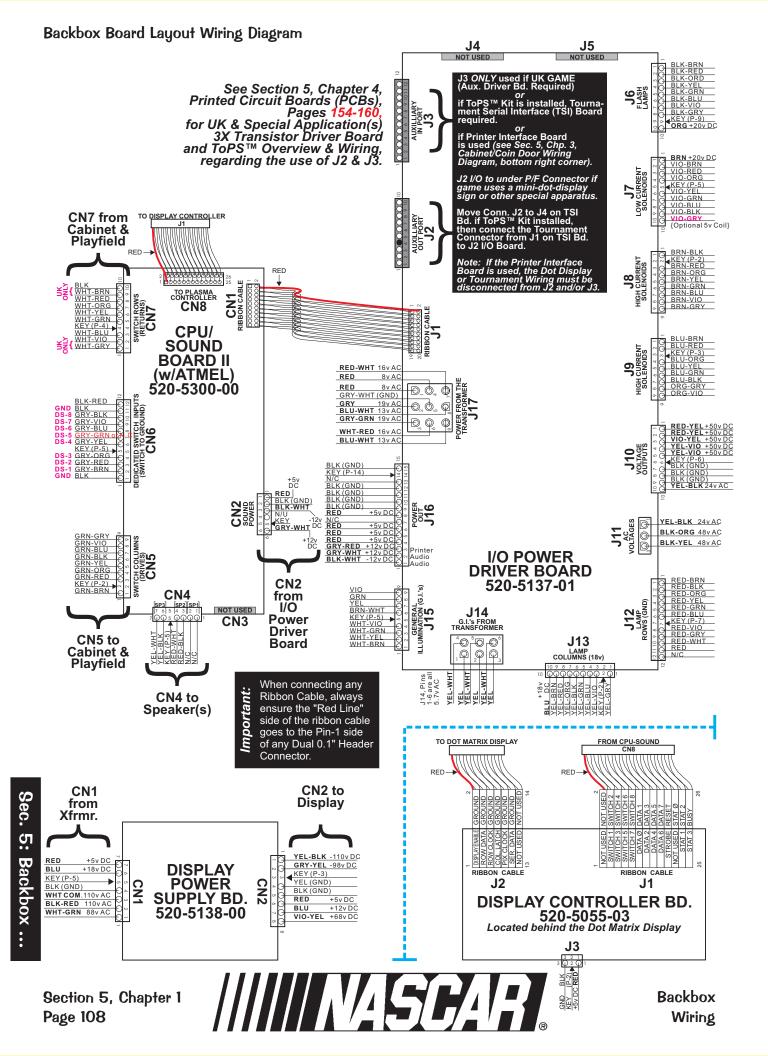


Backbox

Wiring



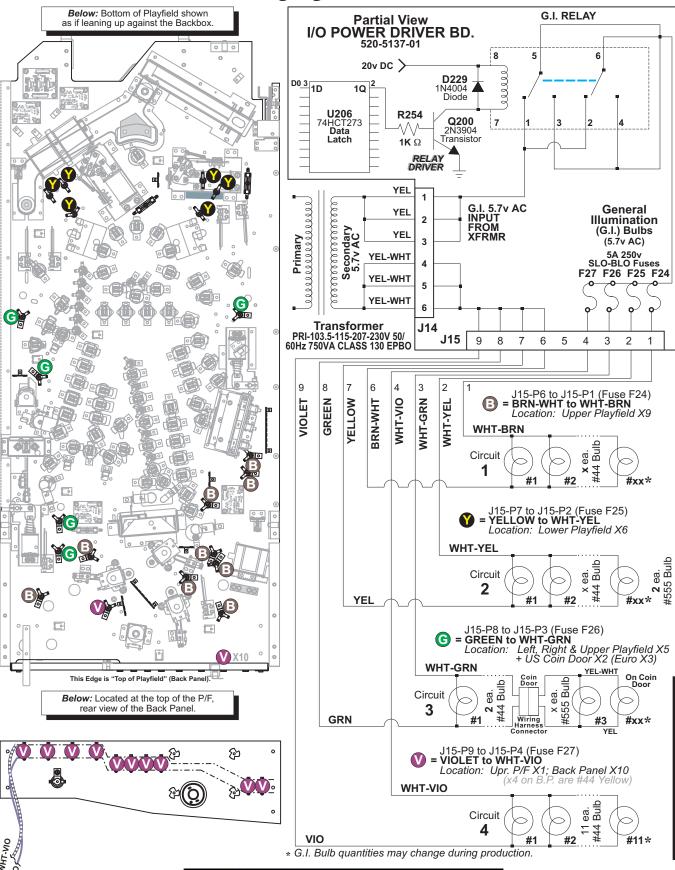
Section 5, Chapter 1 Page 107



Sec. 5: Playfield

Playfield Wiring

General Illumination Circuit Detailed Wiring Diagram

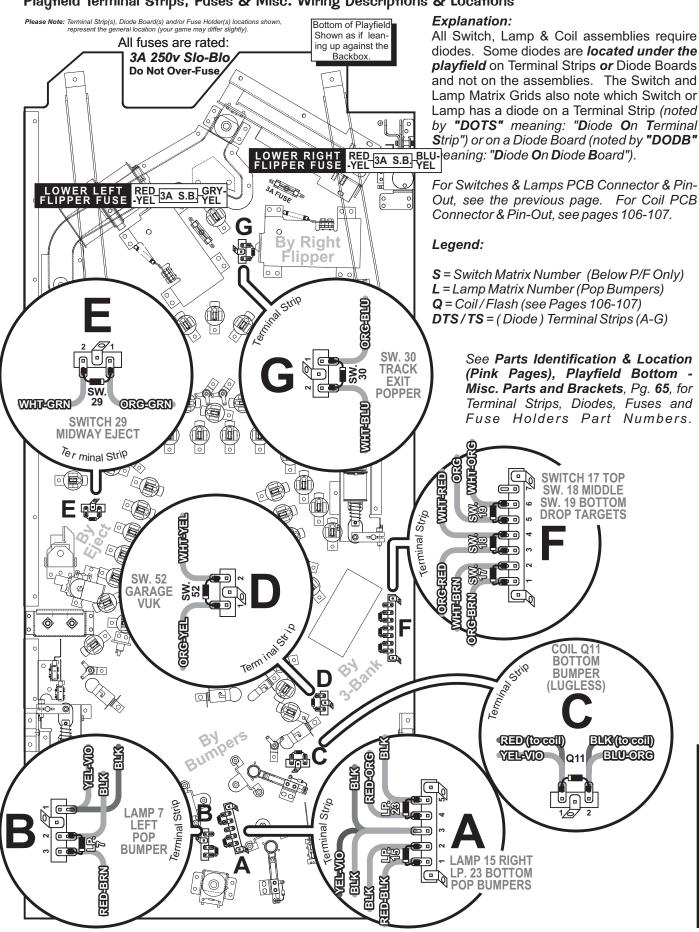




Section 5, Chapter 2 Page 110

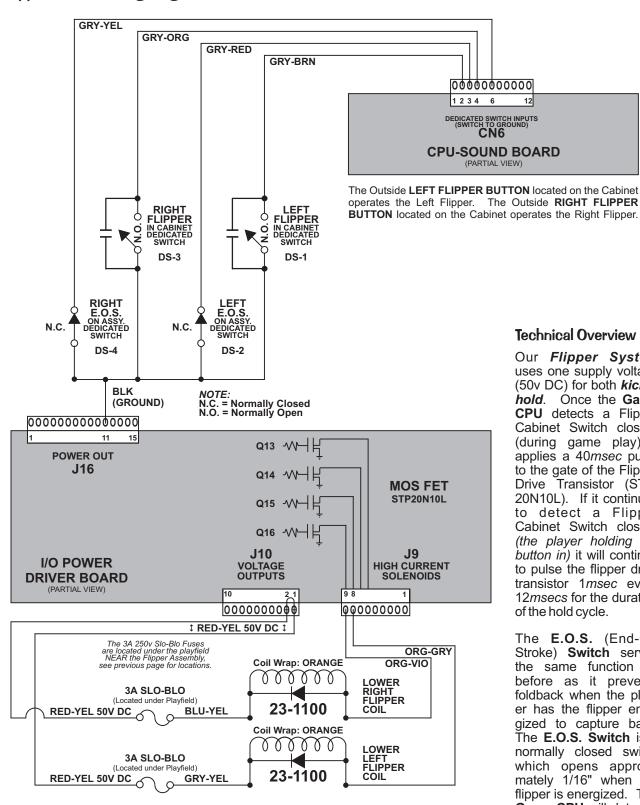


Playfield Wiring



Playfield Wiring



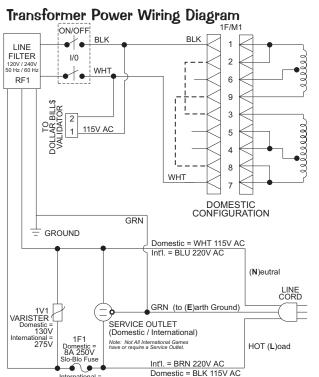


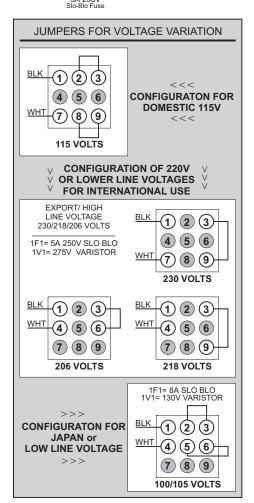
Technical Overview

Our Flipper System uses one supply voltage (50v DC) for both kick & hold. Once the Game CPU detects a Flipper Cabinet Switch closure (during game play) it applies a 40msec pulse to the gate of the Flipper Drive Transistor (STP-20N10L). If it continues to detect a Flipper Cabinet Switch closure (the player holding the button in) it will continue to pulse the flipper drive transistor 1msec every 12msecs for the duration of the hold cycle.

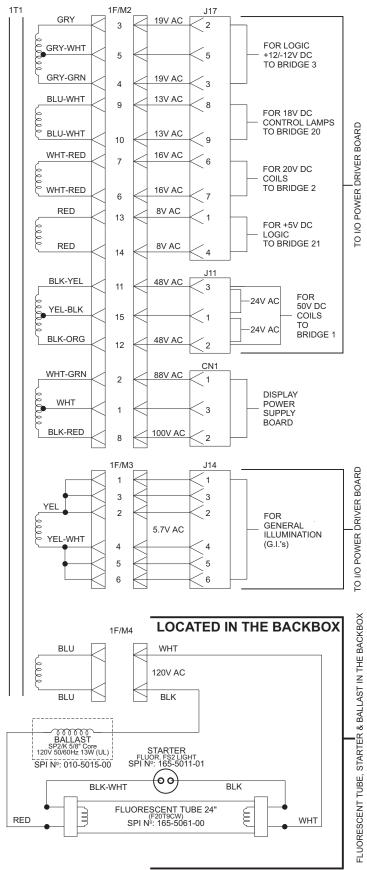
The E.O.S. (End-Of-Stroke) Switch serves the same function as before as it prevents foldback when the player has the flipper energized to capture balls. The E.O.S. Switch is a normally closed switch which opens approximately 1/16" when the flipper is energized. The Game CPU will detect a switch closure if the flipper bat is forced back by a high velocity shot or rebound on the playfield and will apply another 40msec pulse of 50v DC to the coil.





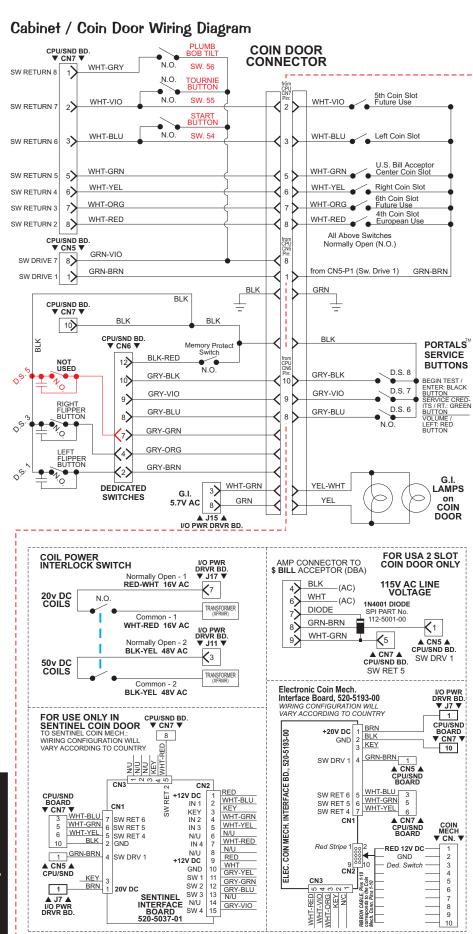


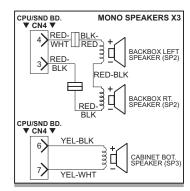
-•∩ •-

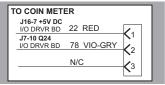


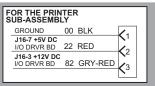


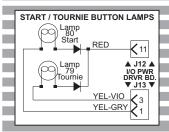




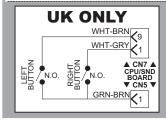








UK ONLY: 2 Extra Cabinet Buttons for the Post Save™Feature are used. The Left Button operates the Left Outlane Ball Deflector. The Right Button operates the Right Outlane Ball Deflector. Both buttons pushed together operate the Center Up/Down Post. Both buttons are located under the Flipper Buttons.



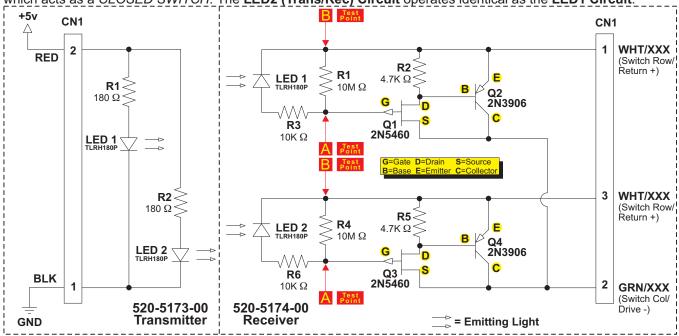


COIN DOOR

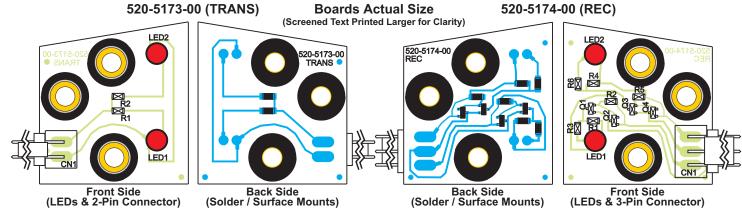
Printed Circuit Boards (PCBs)

Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic

As light from the **Transmitter LED1** falls on the **Receiver LED1**, it generates a Positive Bias Voltage (0.7v to 1.5v) which is applied to the **Gate** (**G**) of **Q1** (**Fet 2N5460**) turning **Q1** off. When **Q1** is held off, no current flows through **Q2**'s (**2N3906**) **Base** (**B**). With no base current, **Q2** is off and acts as an *OPEN SWITCH*. When the light is interrupted (BLOCKED) R1 (Rec. Bd.) bleeds the gate voltage off of Q1 allowing it to conduct, switching Q2 on, which acts as a CLOSED SWITCH. The LED2 (Trans/Rec) Circuit operates identical as the LED1 Circuit.



Trough Up-Kicker Dual OPTO Boards Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	
A	1112233111222222233	515-0173-00 520-5173-00 045-511-02 165-5052-00 121-5067-00 530-5308-02 545-5518-00 515-0174-00 045-5111-03 165-5052-00 110-5006-00 110-0086-00 121-5082-00 121-5083-00 121-5083-00 121-50818-00 530-5308-02 545-5518-00	Dual-OPTO Trans. Bd. Assy. Dual-OPTO Trans. Board CN1 LED1, LED2 R1, R2 n/a n/a Dual-OPTO Rec. Bd. Assy. Dual-OPTO Rec. Board CN1 LED 1, LED 2 Q1, Q3 Q2, Q4 R1, R4 R2, R5 R3, R6 n/a n/a	Replacement Part: LED TLRH180P (T1-3/4 GaAlAs) SPI Part Nº: 165-5052-00

Printed Circuit Boards (PCBs)



DESCRIPTION

PCB Assy. (with all Items 1-5)
PCB Assy. (with Items 1-3 only)
2X, 156" Rt. Angle (26-60-5020) Conn.
LED TLRH180P (Ultra Bright Red)
180 Ω 1/8W Chip Res. (CRCW)
OPTO PCB Brass Tube Spacer
OPTO PCB Rubber Grommet
PCB Assy. (with all Items 1-9)
PCB Assy. (with Items 1-7 only)
3X, 156" Rt. Angle (26-60-5030) Conn.
LED TLRH180P (Ultra Bright Red)
2N5460, Transistor (P-FET SOT-23)
2N3906, Transistor
10M Ω 1/8W Chip Res. (CRCW)
4.7K Ω 1/8W Chip Res. (CRCW)
10K Ω 1/8W Chip Res. (CRCW) OPTO PCB Brass Tube Spacer OPTO PCB Rubber Grommet

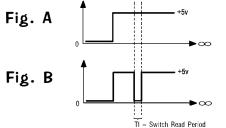
OPTO Troubleshooting

1. Volt Meter Test (indicates normal operating condition):

A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place meter leads across points **A** and **B** on the **LED1 Circuit** (*Refer to Schematic Drawing on previous page, 520-5174-00 Receiver Side*). It should read approximately 0.8 - 1.2v DC. The **LED2 Circuit** operates the same.

B. **CLOSED OPTO** (Light Blocked) = *SWITCH CLOSED*. Place meter leads across points **A** and **B** on the **LED1 Circuit** (*Refer to Schematic Drawing on previous page, 520-5174-00 Receiver Side*). It should read approximately 0.0 - 0.1v DC. The **LED2 Circuit** operates the same.

2. Oscilloscope Test (indicates normal operating condition):

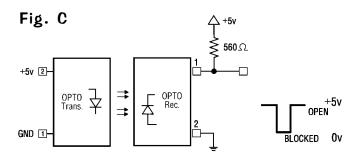


- A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (see Schematic). The Scope should display a **STEADY +5v** as shown in **Fig. A**, Wave Form Diagram.
- B. CLOSED OPTO (Light Blocked) = SWITCH CLOSED. Place Scope lead at Pin-1 of OPTO Rec. Board with Scope Grounded (see Schematic). The Scope should display a PULSE STREAM indicating Q2 has switched "On" as shown in Fig. B, Wave Form Diagram. This is your Switch Drive Pulse.

3. Bench Test (See Fig. C):

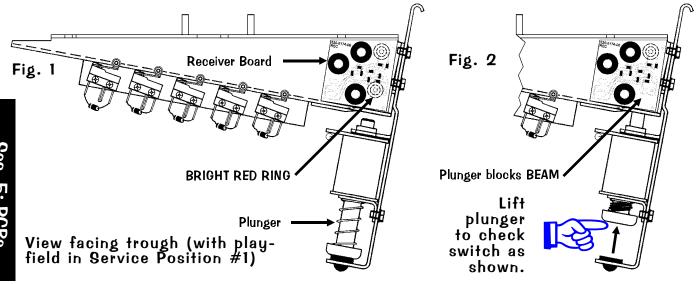
Please Note: To perform this test you must use a spare 560Ω Pull-Up Resistor, SPI Nº: 121-5047-00

Disconnect the **OPTO Transmitter / Receiver Board** from the circuit. Connect one side of a 560Ω Pull-Up Resistor to **Pin-1** of the OPTO Receiver Bd. and the other side of the resistor to a 5v DC source. Connect **Pin-2** to GND. Connect a +5v DC source to **Pin-1** of the Transmitter & GND to **Pin-2**. Align with the Receiver OPTO approx. 3" distance. Using your Volt-Meter or an Oscilloscope, monitor **Pin-1** while *BLOCKING* and *UNBLOCKING* the **BEAM** from the Trans. The output will be approx. +5v DC when the **BEAM IS NOT BLOCKED** and approx. 0v when the **BEAM IS BLOCKED**.



Trough Dual OPTO Boards Alignment / Test for LED1

When a working **OPTO** is installed and connected in a game, the transmitter should light (*LED1 lower & LED2 upper*) when the power is switched on. With the playfield in **Service Position #1** (playfield lifted up in the half-way position resting on the Prop Rod or edge slide support brackets) and the game on, the LED lights should show up as a **BRIGHT RED RINGS** through the back of the Receiver Board around the **Receivers LED1 & LED2** (see **Fig. 1**). Testing only **LED1:** With the game in **Switch Test Mode**, lifting the Trough Plunger with a fingertip should block the **BEAM** and cause the Switch Position to trigger (see **Fig. 2**). View **Fig. 2a & 2b** (on the next page) for a sectional view of the Light Path (note alignment) and what happens as a ball breaks the light beam.



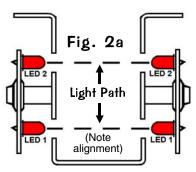
Section 5, Chapter 4 Page 116

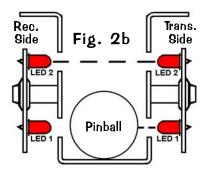


Printed Circuit Boards (PCBs)

Trans.

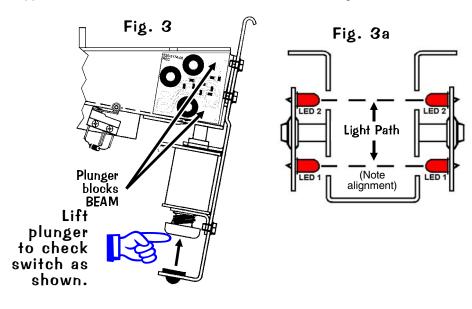
Side

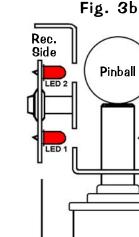




Trough Dual OPTO Boards Alignment / Test for LED2

When a working **OPTO** is installed and connected in a game, the transmitter should light (*LED1 lower & LED2 upper*) when the power is switched on. With the playfield in **Service Position #1** (playfield lifted up and resting on the Playfield Support Slide Brackets) and the game on, the LED lights should show up as a **BRIGHT RED RINGS** through the back of the Receiver Board around the **Receivers LED1 & LED2** (see **Fig. 1**, previous page). Testing only **LED2**: *TO PERFORM THIS TEST*, A PINBALL MUST BE IN THE BALL TROUGH. With the game in **Switch Test Mode**, lifting the Trough Plunger with a finger tip should block the **BEAM** on LED2 and cause the Switch Position to trigger (see **Fig. 3**). View **Fig. 3a & 3b** for a sectional view of the Light Path (note alignment) and what happens as a "double-stacked" ball scenario breaks the light beam.





IMPORTANT

If replacement of *LED* is required, insure that is mounted correctly before and after soldering (See Fig. 4a / 4b).

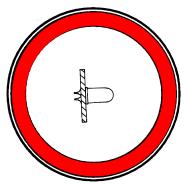


Fig. 4a
Correct Position

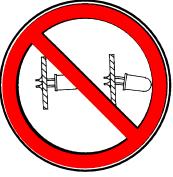
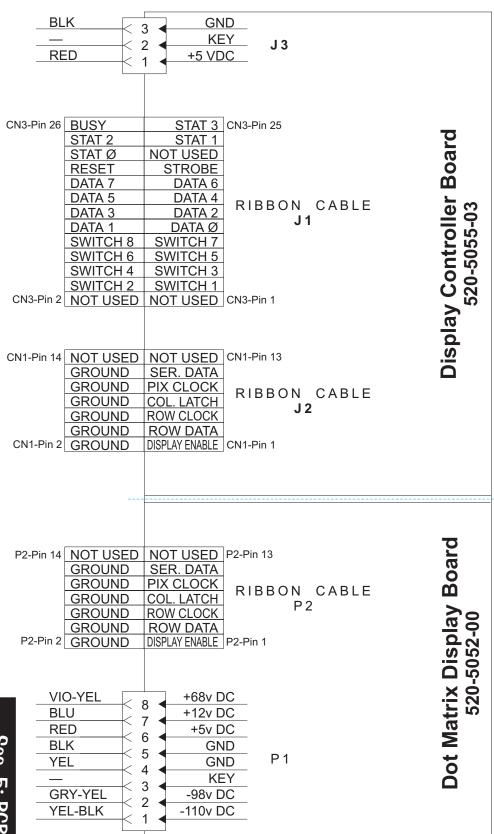


Fig. 4b
Incorrect Position



Printed Circuit Boards (PCBs)



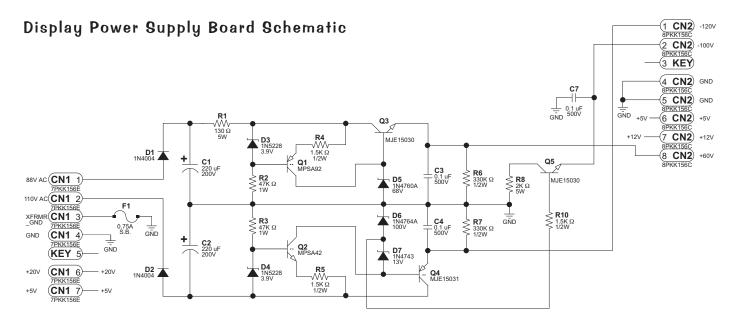
Dot Matrix Display Explained

The display utilizes a Micro-Processor Control Board mounted in piggyback fashion to the Dot Matrix Display (128 X 32) Driver Board. The purpose behind this board is to provide more information to the operator as well as displaying graphics to the player.

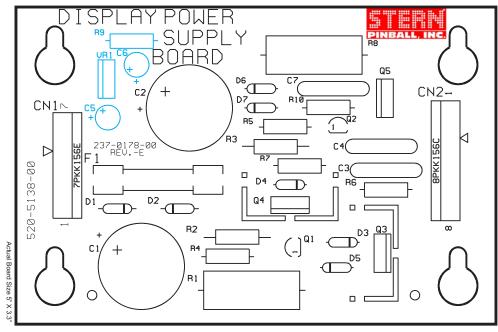
The board is controlled by a 6809E Micro processor and its personality ROM (Unique to the Game). It receives Data, Reset & Clock Information from the CPU/Sound Board via the ribbon cable and sends back multiple Status and Busy Signals to the CPU. This is to insure synchronized communication between the CPU and the Display Controller Board. The Drivers for the rows and columns are provided on 5 surface mounted integrated circuits on the Dot Matrix Display Driver Board.

Section 5, Chapter 4 Page 118





Display Power Supply Board Component Layout & Parts

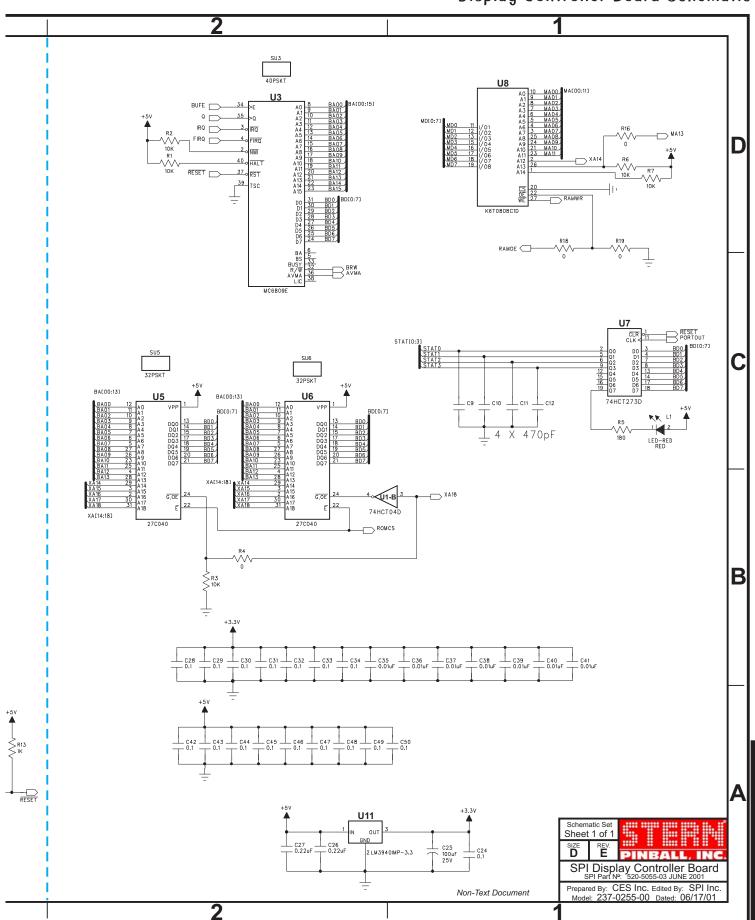


ITEM	OTV	DADT NUMBER	DEE DECICNATOR	DESCRIPTION (NS - N-4 Streffs - 4)
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
	1 2301122111121122221123210	520-5138-00 125-5044-00 125-5035-00 125-5035-00 045-5015-07 045-5015-08 112-5003-00 112-0053-00 112-0062-00 112-0049-00A 112-0061-00 200-5000-17 205-0004-00 110-0101-00 535-5000-11 240-5008-00 237-5501-00 110-0103-00 121-5061-00 121-5061-00 121-5061-00 121-5060-00 121-5060-00 121-5062-00 121-5062-00 124-5003-00	Display Power Supply Board C1, C2 C3, C4, C7 (C5, C6: NS) CN1 CN2 D1, D2 D3, D4 D5 D6 D7 F1 F1 F1 Q1 Q2 Q3, Q5 Q3, Q4 Q3, Q4 Q3, Q4 Q3, Q4 R1 R2, R3 R4, R5, R10 R6, R7 R8 (VR1: NS)	Complete PCB Assembly 220uF, 200v, Radial Lytic Cap. 0.1uF, 500v, Ceramic Disk Cap. 22uF, 35v, Rad Lytic Cap 7PKK156E (PIN5=KEY) 8PKK156 (PIN3=KEY) 1N4004, Diode 1N5228, 3.9v, Diode 1N4760A, 68v, Diode 1N4764A, 100v, Diode 1N4764A, 100v, Diode 3/4A (0.75A) S.B. Fuse Fuse Clip MPSA92, Transistor MPSA42, Transistor MPSA42, Transistor MJE15030, Transistor Heatsinks - AAVID #563002 #6-32 X 3/8" PPH Screw MJE15031, Transistor 130 Ω 5W Res. 47K Ω 1W Res. 1.5K Ω 1/2W Res. (R9: NS) 330K Ω 1/2W Res. (R9: NS) 330K Ω 1/2W Res. 7812CT

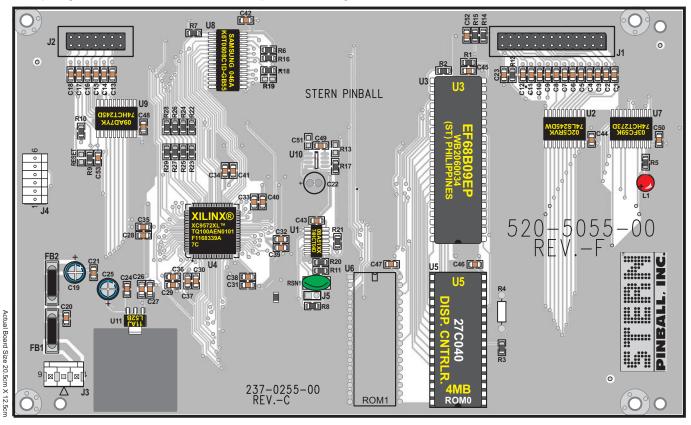
Printed Circuit Boards (PCBs)



Sec. 5: PCBs

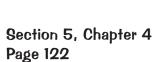


Display Controller Board Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
01 02 03	1 1 1	520-5055-03 045-5015-26 045-5015-02 045-5015-03	Display Controller Bd. (FCC FEB98) Rev. E June 2001 J1 J2 J3	Complete PCB Assembly 13-Pin, Dual row .1" Hdr. Conn HDR2X13 7-Pin, Dual Row .1" Hdr. Conn HDR2X7 3-Pin, PKK156B Connector
04	1		J4	6-Pin (6P100)
05	7		C35-C39, C40, C41	SMT 0.01uF, 50v Cap. 103-0805-X7R
06	20		C21, C24, C28-C32, C33, C34, C42, C43, C44, C45, C46 C47, C48, C49, C50, C53 (C51: NS)	SMT 0.1uF, 50v Cap. 104-0805
07	2		C26, C27	SMT 0.22uF, 50v Cap. 224-1206-Z5U
08	21		C1-C12, C13-C18, C20, C23, C52	SMT 470pF, 50v Cap. 471-0805
09	2		C19, C25	100uF, 25v TCap.
10 11	<mark>1</mark> 4	165-5099-00	L1 R16-R18 (R19: NS)	LED T1-3/4 DIFFUSER RED 0 Ω 1/10W Resistor 0805
12	1	n/a	RESET	DO NOT STUFF
13	2		R11, R13	SMT 1K Ω 1/10W Resistor 0805
14	1		R8	SMT 1M Ω 1/10W Resistor 0805
15	5		R1, R2, R3, R7 (R6: NS)	SMT 10K Ω 1/10W Resistor 0805
16	9		R21, R22-R29	SMT 33 Ω 1/10W Resistor 0805
17	1		R20	SMT 100 Ω 1/10W Resistor 0805
18	2		R9, R15	SMT 100K Ω 1/10W Resistor 0805
19	1		R5	SMT 180 Ω 1/10W Resistor 0805
20	3		R10, R12, R14	SMT 220 Ω 1/10W Resistor 0805
21	1	100-5054-00	U1	SMT 74HCT04D (74LS04)
22	1	100-5055-00	U2	SMT 74LS245DW
23	1	100-0189-01	U3 (40-Pin Socket, 077-X)	MC6809E
24	1	100-5044-00	U4 `	XILINX®, XC9572XL
25	2 (See P	g. DR. 0 Table)	U5 (ROM0) (U6: NS) (32-Pin, IC Dip Socket, 077-5217-00)	4MB ROM 27C040 (M27C401-100)
26	1	100-5056-00	U7	SMT 74HCT273D
27	1	100-5045-00	U8	K6T0808C1D-GB55, Int. Samsung 046A
28	1	100-5057-00	U9	SMT 74HCT245D
29	1	100-5058-00	U11	SMT LM3940IMP-3.3v Regulator
30	1	140-0041-00	RSN1	8MHZRSN (8Mhz) Crystal
31	2	n/a	FB1, FB2	Ferrite Bead, FB0370
32	Ω		FID1-3	FIDTP50M

If a part is required where a part number is not provided, call Technical Support (see back of cover).





3

5v Supply:

An AC voltage of approximately 9v comes into the board at [J17-(1-4)] this AC voltage is then *full-wave rectified* by bridge BRDG 21 and filtered by Capacitor C203. The resulting voltage is 11v DC which is inserted into a linear voltage regulator for the output of 5v DC. This 5v regulated voltage can be adjusted by potentiometer R116 the voltage should be set to 5.00v. Besides powering the I/O Board the regulated 5 volts supplies power to the CPU / Sound Board, Gas Plasma (Dot Matrix) Display and Plasma (Display) Controller Board. Power for these devices comes off the I/O Board on [J16-(4-8)].

+5v, +20v, +50v, +18v, & +12v LED Indicators:

These DC voltages are derived on the **I/O** Board by rectification and filtering. Each has a **LED** indicating that power is being supplied to each of these voltage sources. The **-12v** supply comes from the same transformer winding as the **+12v** thus it does not have a **LED** indicator.

** **Note** that the +50v & +20v power sources are turned off by the Interlock Switches when the Coin Door is OPEN.

LED	SUPPLY VOLTAGE
L2	+5
L200	+20v
L201	+50v
L202	+18v
L203	+12v

Reset Circuitry:

The I/O will reset in three (3) cases:

- 1. The CPU is in reset. The CPU's reset signal is fed into the **I/O** through connector **J1** and forces the **I/O** into reset.
- 2. The 5v supply has fallen below 4.75v.
- 3. The watchdog is not being fed by the scanning of the light matrix. More specifically **Pin-19** of **U6** must be toggling once every **50ms** to prevent the watchdog from resetting. The scanning of the light matrix is controlled by the CPU through **J1**.

LED L204 shows the reset state of the **I/O Board**. If this **LED** is not lit either the 5v DC is below 4.75v or the **CPU/Sound Board** is holding the **I/O** in reset. If the **LED** is flashing this means that the watchdog is not being feed by the **CPU/Sound Board** and the **I/O** is oscillating into and out of reset. If the **LED** is continuously on the board is out of reset and communication from the CPU to the lamp matrix is confirmed. **Testpoint Blanking** is the actual reset signal on the **I/O Board**. A low voltage indicates that it is in reset this will turn off all Solenoid (*Coil*) Drivers, Flash Lamps, Lamp Matrix Drivers, Auxiliary Outputs and Flipper Outputs. A high voltage indicates that it is out of reset and normal operation can take place.

Address Decoding:

All Address decoding is done by two **74LS138's (U204 & U205)** (3 of 8 decoder). Both of these must be in operation for the **I/O Board** to function properly.

Solenoid (Coil) Drivers & Flash Lamps:

J8 & J9 are high side drivers for driving solenoids and other heavy loads. Each connector has its own buffer driving 8 drivers. J8 & J9 consist of MOSFET Drivers 20N10L which can easily & safely be tested by clipping one end of a clip-lead to test point FET TPL1 and then the other to the corresponding gate resistor R1-R16 (see Note 1). This will apply 3.4v to the gate of the MOSFET Transistor thus switching it on. J7 & J6 each are a bank of 8 low side driver for driving lamps or other lower current solenoids (coils). They use a Bipolar Power Transistor TIP122 which can also be tested by using TEST POINT TIP TPL3 and the corresponding resistors R17-R32* (see Note 1).

Note 1 • Clip on the resistor side with the white stripe. •• R1 controls Q1, R2 controls Q2, et cetera...

Auxiliary In & Out:

J2-8 CMOS Outputs sometimes used for a printer interface.

J3-8 CMOS Inputs general purpose inputs.

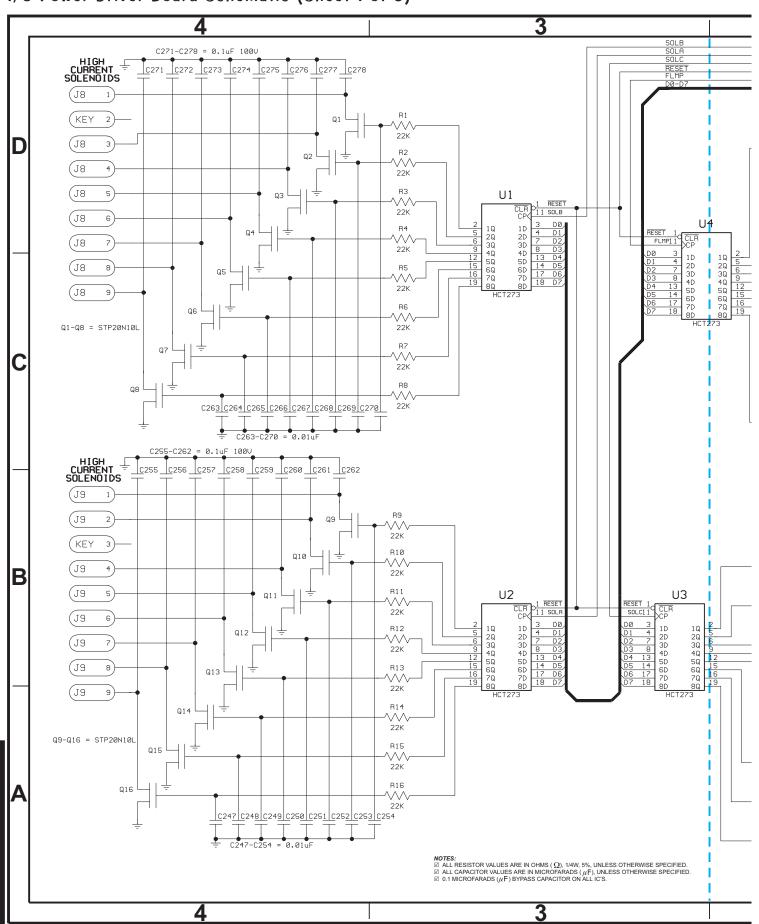
Lamp Matrix:

J12 has 10 low side drivers for the lamp strobes which consist of **19N06L MOSFETS**. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the **I/O** from resetting. **J13** has 8 high side drivers with each having a status indicator. All the status indicators are logically 'OR'ed together and fed back to the **CPU/Sound Board**. The status can identify open loads *(for example open lamp filaments or intermittent connections)* and short circuits. These drivers are also short-circuit protected.

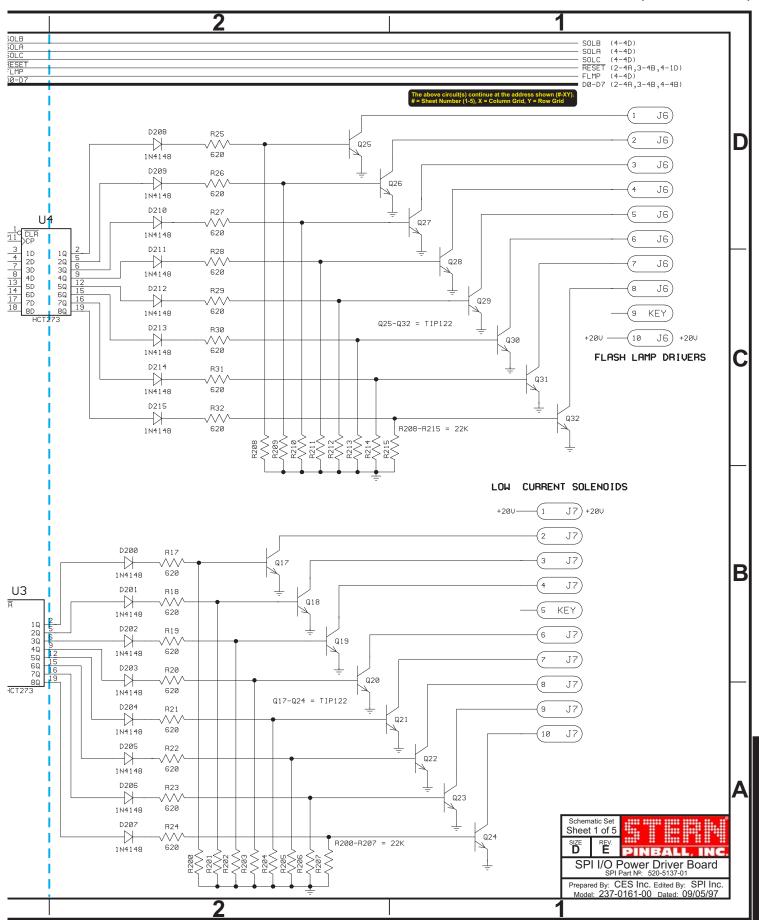
General Illumination (G.I.) Lights:

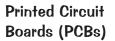
J15 has 6v AC switched on & off by a relay on the I/O Board. The relay is controlled by Q200 which supplies power to the 24v coil winding to activate the relay. There are 4 taps on J15 each fused at 5A for this 6v AC source.



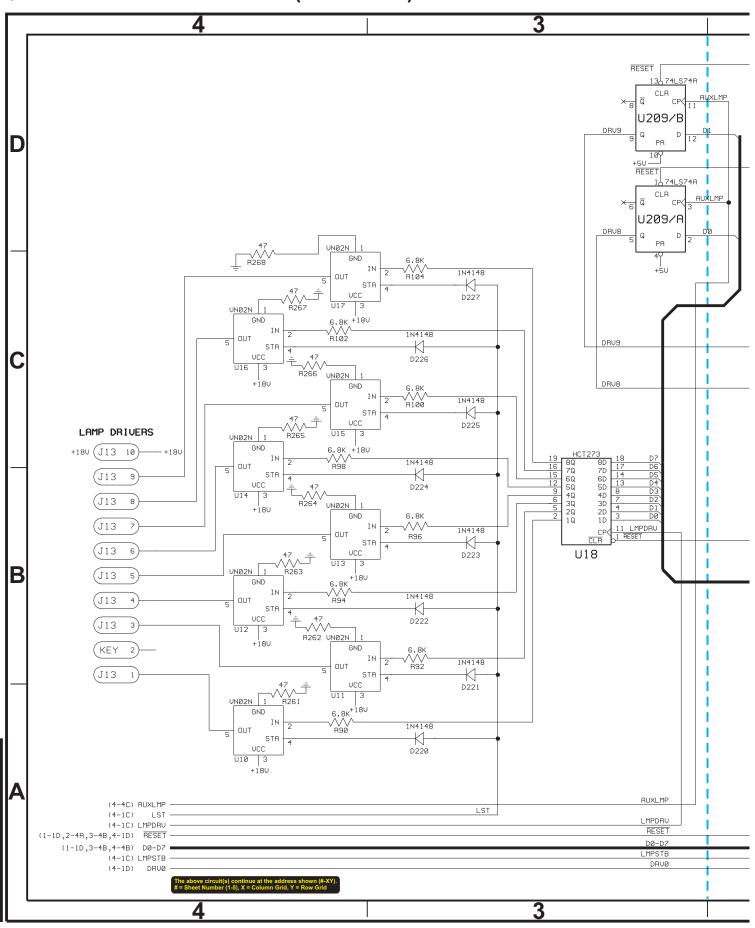




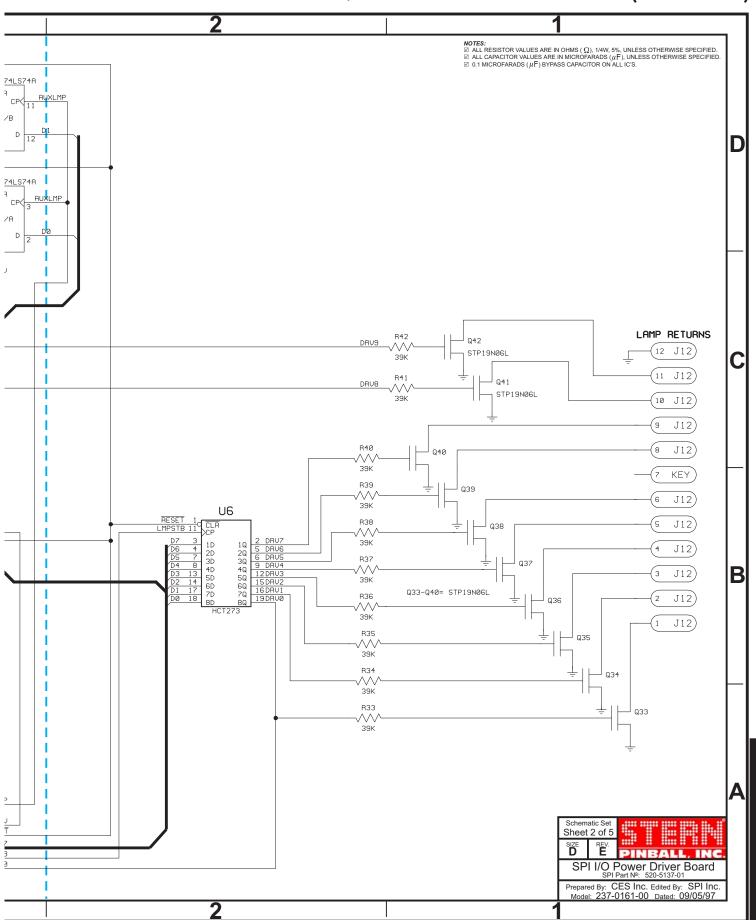


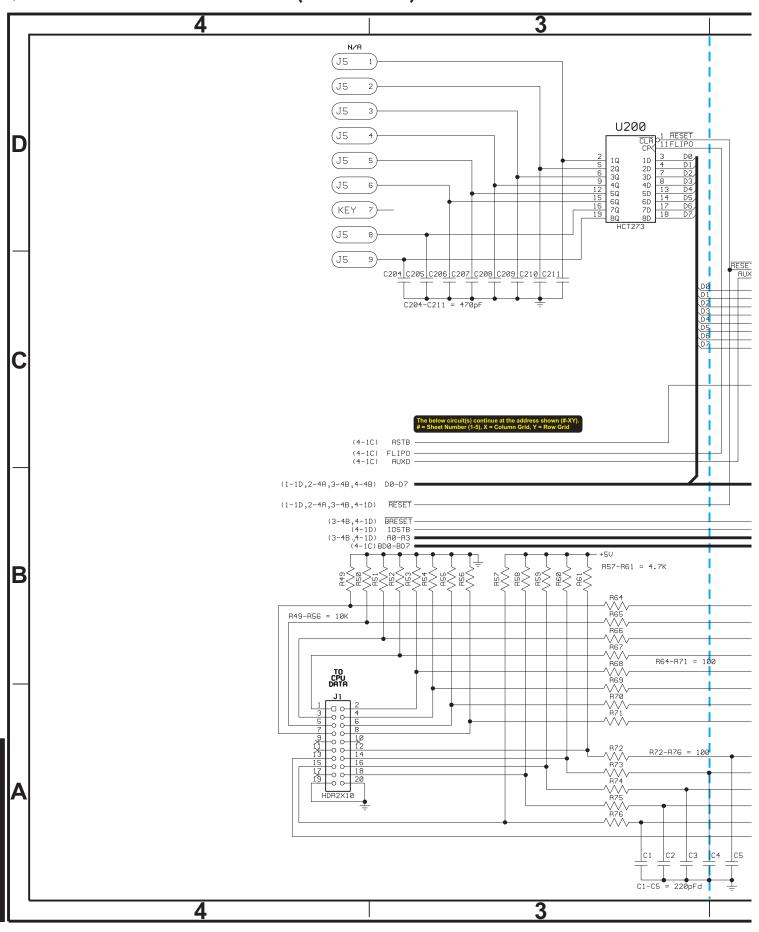






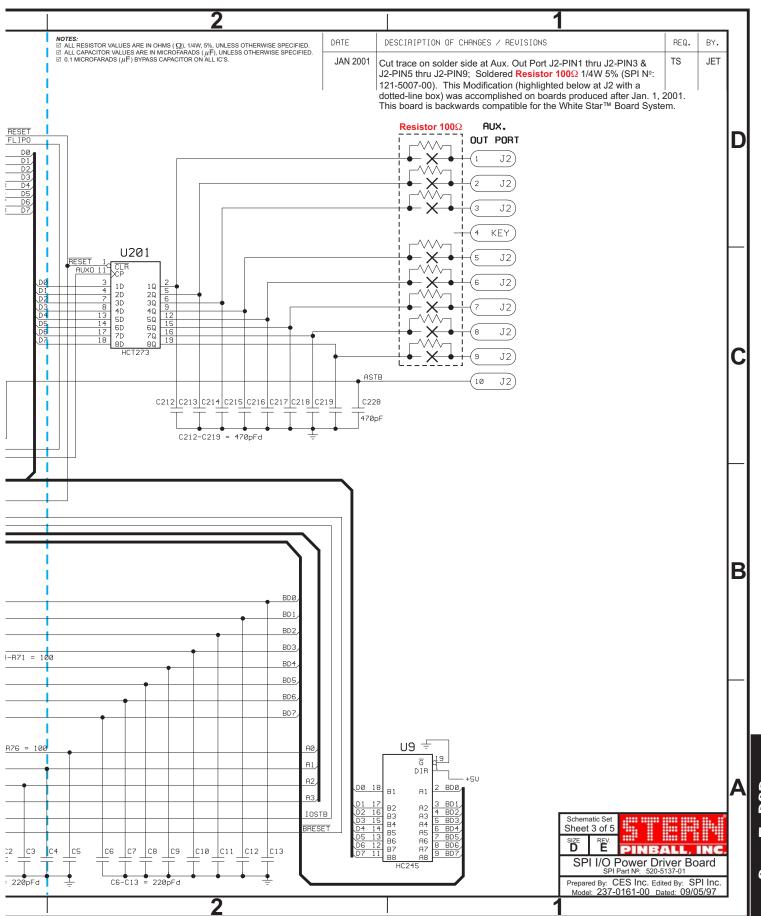


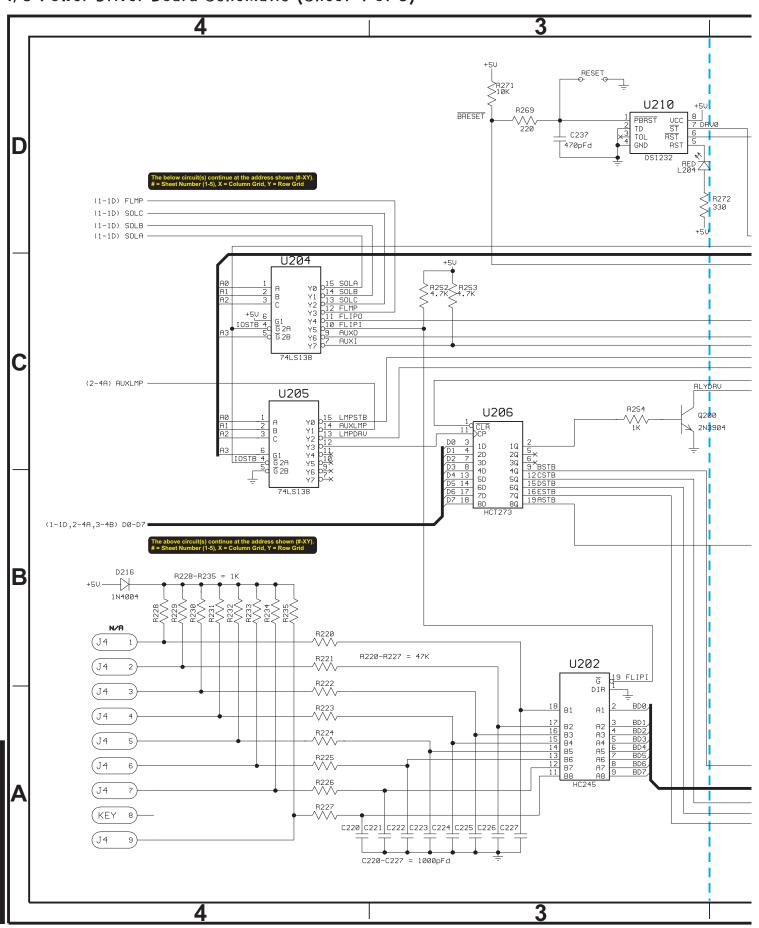




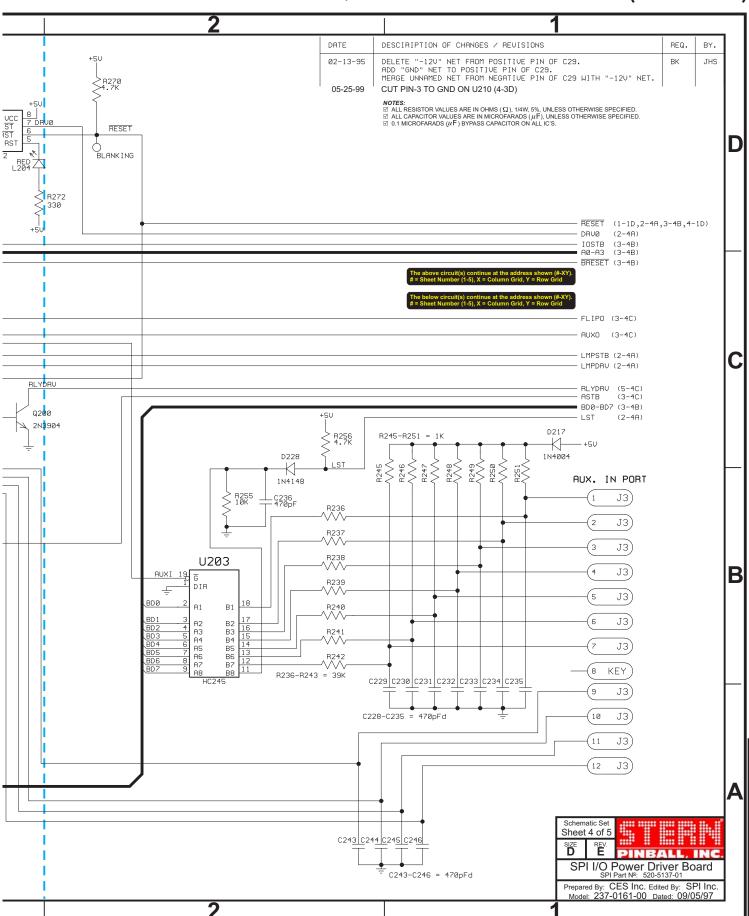


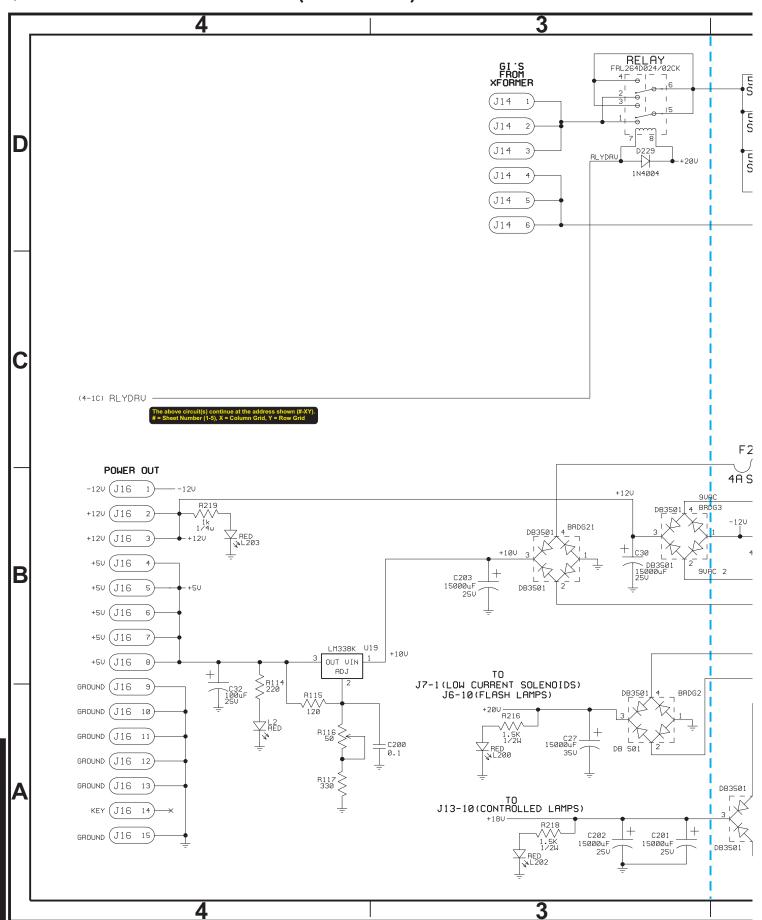




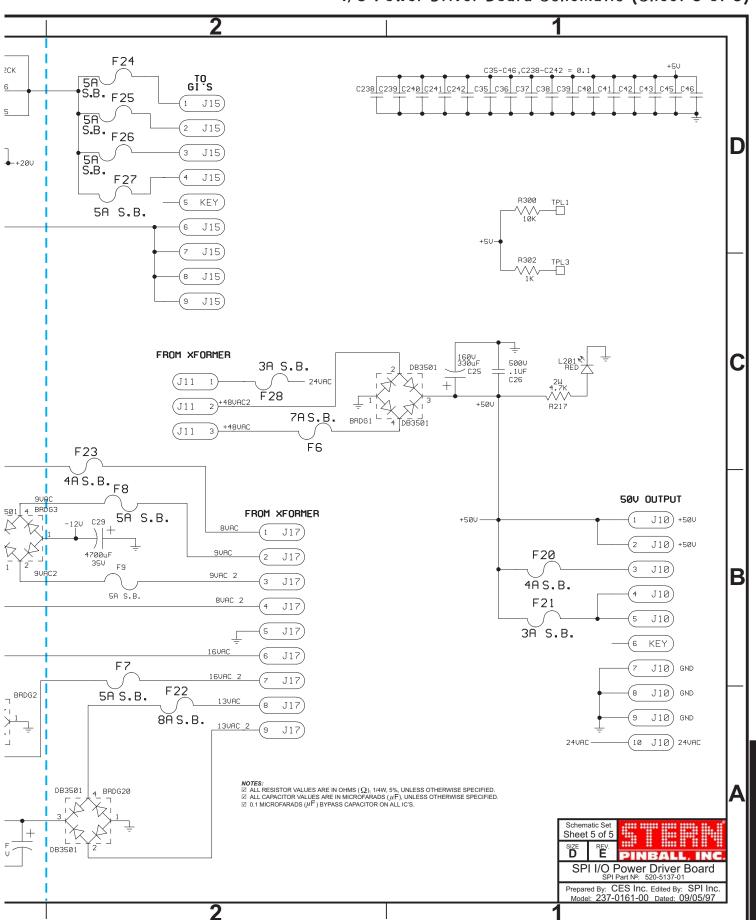












Section 5, Chapter 4 Page 134



Printed Circuit Boards (PCBs)

I/O Power Driver Board Parts

1/0	I/O Power Driver Board Parts				
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)	
01 02 03 04 05A 05B 06 07 08	1 5 13 1 4 1 1 1	520-5137-01 112-5000-00 125-5030-00 125-5033-00 125-5036-00 125-5036-01 125-5036-01 125-5034-00 125-5032-00 125-5031-00	VO Power Driver Board Rev. G BRDG1, BRDG2, BRDG3, BRDG20, BRDG21 C1, C2, C3>C6, C7, C8, C9>C10, C11, C12 C25 C26 C30, C201, C202, C203 C27 C29 C32 C35, C36, C37, C38, C39, C40, C41, C42, C43, C45, C46, C200, C238, C239, C240, C241, C242 C212>C219, C228>C237, C243>C246 (C204-C211: NS)	Complete PCB Assembly DB3501 220pF, (221), Cap. 100uF, 150v, Radial Lytic Cap. .1UF, 500v, Ceramic Disk Cap. 15000uF, 25v, Radial Lytic Cap. 15000uF, 35v, Radial Lytic Cap. 4700uF, 35v, Radial Lytic Cap. 100uF, 25v, Radial Lytic Cap. 0.1uF, (104), Cap.	
09 10	22 0	125-5028-00	C212>C219, C228>C237, C243>C246 (C204-C211: NS)		
11 12	16 0	125-5029-00 125-5027-00	C247>C254, C263>C270 (C255>C262, C271>C278: NS)	0.01uF, (103), 100v Cap. 0.1uF, (104), 100v, Cap.	
13	25	112-0054-00	D200>D207 D208>D215 D220 D221 D222 D223	1N4148, Diode	
14 15 16 17 18 19 20 21 22	26 1 7 2 1 2 1	112-5003-00 205-0004-00 200-5000-03 200-5000-01 200-5000-08 200-5000-06 045-5015-01 045-5014-01	D224, D225, D226, D227 D217, D229 (D216; NS) F6, F7, F8, F9, F20, F21, F22, F23, F24> F27, F28 F6 F7, F8, F9, F24>F27 F21, F28 F22 F20, F23 J1 J2 (Key Pin-4), J6 (Key Pin-9), J7 (Key Pin-5) J10 (Key Pin-6), J13 (Key Pin-2) J3 (Key Pin-8)	1N4004, Diode Fuse Clips 7A 250v S.B. Fuse 5A 250v S.B. Fuse 3A 250v S.B. Fuse 8A 250v S.B. Fuse 4A 250v S.B. Fuse 20-Pin, 0.1 Dual Row Header 10PKK156	
23	1	045-5015-00	J3 (Key Pin-8)	12PKK156	
24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	0 1 1 1 1 1 6 16 16 10 1 132 167 8 111 13	045-5013-00 045-5015-00 045-5015-00 045-5016-00 045-5016-00 045-0014-09 110-0106-00 110-0067-00 110-0069-00 121-5042-00 121-5042-00 121-5021-00 121-5021-00 121-5011-00 121-501-00	(J4* J5: NS) J8 (Key Pin-2), J9 (Key Pin-3), J15 (Key Pin-5) J11 J12 (Key Pin-7) J14 J16 (Key Pin-14) J17 L2, L200, L201, L202, L203, L204 O1>Q16 Q17>Q24, Q25>Q32 Q33>Q42 Q200 R1>R8, R9>R16, R200>R207, R208>R215 R17>R24, R25>R32 R33>R42, R236>R242 R49, R57>R61, R253, R256, R270 (R252: NS) R50>R56, R255, R271, R300 R64>R76	9PKK156 10-84-4030 (3-Pin MOLEX) 12PKK156 10-84-4060 (6-Pin MOLEX) 15PKK156 10-84-4090 (9-Pin MOLEX) LED T1-3/4 DIFFUSER LED 22NE10L STP, Transistor TIP122 19N06L STP, Transistor 2N3904, Transistor. 22K Ω 1/4W Res. 620 Ω 1/4W Res. 620 Ω 1/4W Res. 4.7K Ω 1/4W Res. 10K Ω 1/4W Res. 10K Ω 1/4W Res.	
41 42 43 44 45 46 47 48 49 50 50 50 50 50 50 50 50 50 50 50 50 50	8211221181 <mark>2</mark> 8118111211	121-5029-00 121-5033-00 121-5039-00 121-5036-00 121-5038-00 121-5009-00 121-5009-00 121-5009-00 121-5002-00 n/a 100-5012-00 110-0058-00 100-5038-00 100-0336-00 n/a 100-0338-00 100-0338-00 100-037-00 n/a		6.8K Ω 1/4W Res. 220 Ω 1/4W Res. 120 Ω 1/4W Res. 120 Ω 1/4W Res. 50 Ω Pot 330 Ω 1/4W Res. 1.5K Ω 1/2W Res. 1.5K Ω 1/2W Res. 4.7K Ω 2W Res. (SANDBAR) 1K Ω 1/4W Res. 47 Ω 1/4W Res. 47 Ω 1/4W Res. FRL264D024/02CK Relay Test Point Wire (24ga.) Loops 74HCT273 74LS245 DS1232 VN02N LM338K Heatsink (5v Reg.) 74HC245 74LS138 74LS74 Test Points	







CPU/Sound Board II (with ATMEL Processor) Theory of Operation

CPU Section:

The CPU is a 68B09E (U209) with up to 8 MBytes of CPU Code Space (U210). The CPU code is bank selected by the use of U211 and each bank consists of 16 KBytes. 8 KBytes of RAM (U212) is available to the CPU. The RAM is battery backed and has a write protected area. Battery back up is accomplished by 3-AA Cells (BAT1) Battery Pack which has a TEST POINT (TP): VBATT to check the battery voltage status. The write protected area consists of 512 Bytes used for storing game settings. This section of RAM can only be written to when the coin door is open. The Coin Door switch comes into the CPU on CN6-12 and is fed into the address decoding PAL U213. When this memory protect signal is low writes to the protected RAM area are prohibited. Address decoding for the system is accomplished by one PAL U213 and one 1-of-8 decoder U214.

A watchdog is used to monitor the **CPU** and the 5v supply. If the 5v supply is below 4.75 the watchdog will hold the **CPU/Sound Board** & **I/O Board** in *reset*. The watchdog must be fed at a rate of **250ms** or faster. The signal used to feed the watchdog comes from the EPROM Bank select signal used to load **U211**.

The I/O Interface CN1 is buffered by two (2) HC245 Chips (U207 & U208). The CPU's reset line is buffered by Q10 and fed over to the I/O through CN1. An I/O Strobe Signal is fed through CN1-15 and is used to notify the I/O that a valid address is being sent.

Switches:

The Switch Matrix consists of eight (8) **2N3904** Transistors(**Q1-Q8**) which pull one of 8 strobes 'low' to *activate* a Single Column of switches. The *Switch Return Signals* are fed into **CN7** [SWITCH ROWS] and are highly filtered and compared to a 2.5v reference voltage. The *Switch Return Voltage* must be below 2.5v to make a *Valid Switch Closure*. If *false switches* are appearing, check that none of the **2N3904** Transistors are permanently pulling the *strobe line low*. Only one strobe from **CN5** [SWITCH COLUMNS] should be *low at any time*. **CN6** [DEDICATED SWITCH IN] is a *Dedicated Bank of Input Switches*. Switches connected to **CN6** are connected to ground instead of a strobe and may be read at any time.

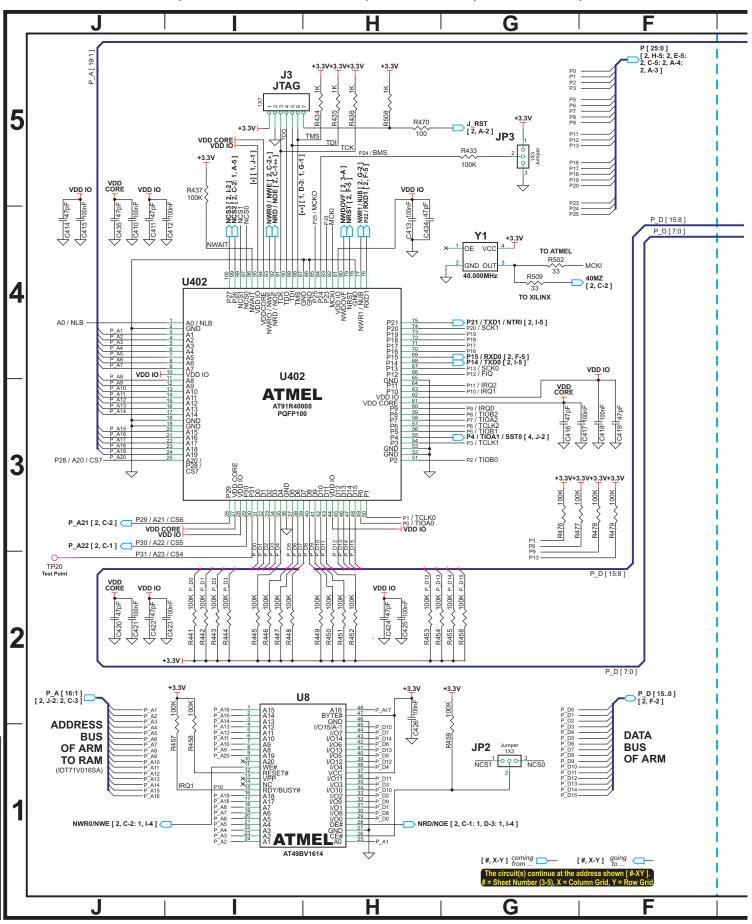
Plasma Interface:

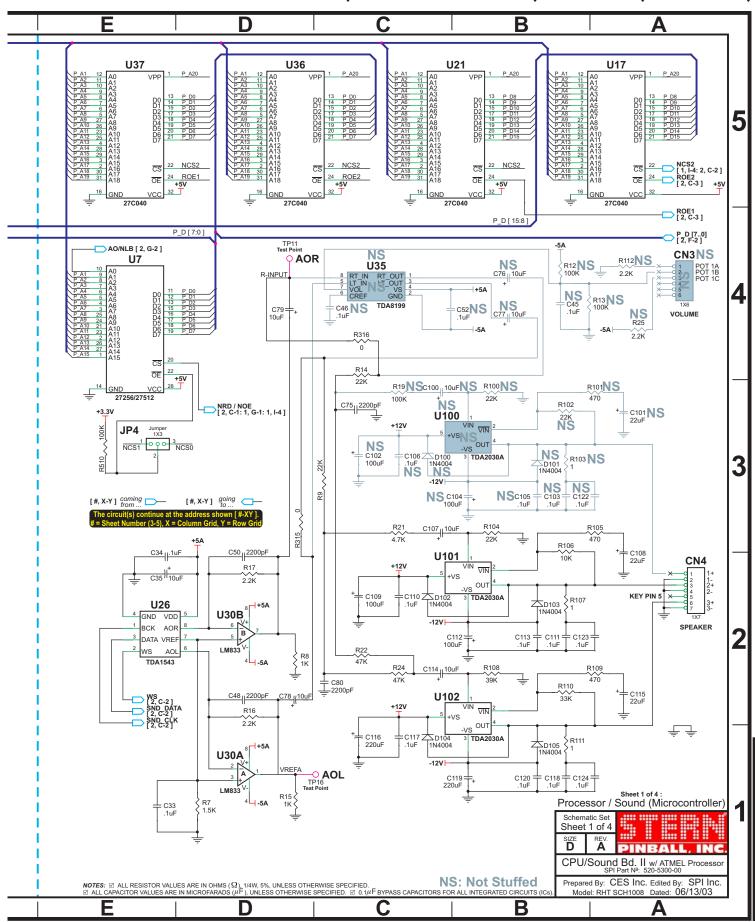
The data path for communication to and from the **Plasma Controller Board** is 8 bits wide. There are separate *Input* and *Output Busses*. Data going out to the controller comes from the **CPU**'s *Data Bus* through **U201** and onto **CN8-Pins 11-18**. Status back from the Plasma Controller comes in on **CN8-Pins 22-26** and is fed into **U202** for input to the **CPU**'s *Data Bus*. Two control signals that go out to the Plasma Controller are **PRES** [TP17: PLASMA RESET] and **CN8-Pin 19** [**PSTB** - *Plasma Strobe*]. The Plasma Reset is software controllable through **U216/B** and also has a test point "Plasma Reset". The *Plasma Strobe Signal* to the controller is generated from **U216/A** and is *used to latch data* into the Plasma Controller.

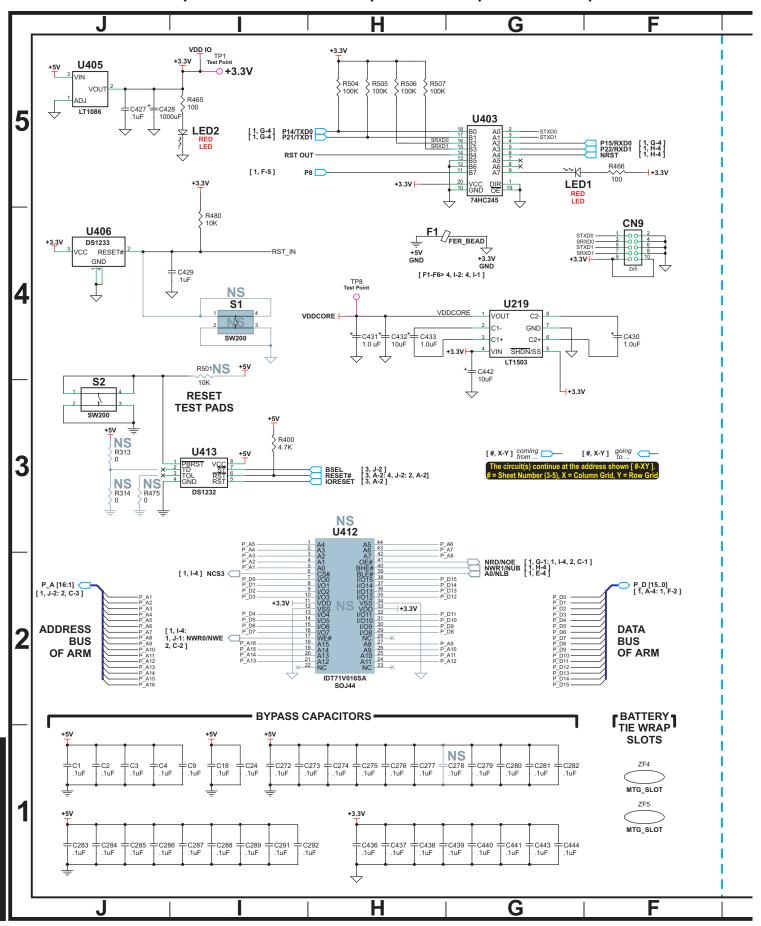
Other Test Points (TP):

TP 7: E & TP5: Q - The CPU signals for both 68B09E processors. Should be at 2Mhz with Q leading E by 500 nsec. TP2: P0. TP3: P1. TP4: P2. TP20: (near U402). TP8: (near U219). TP1: +3.3V.

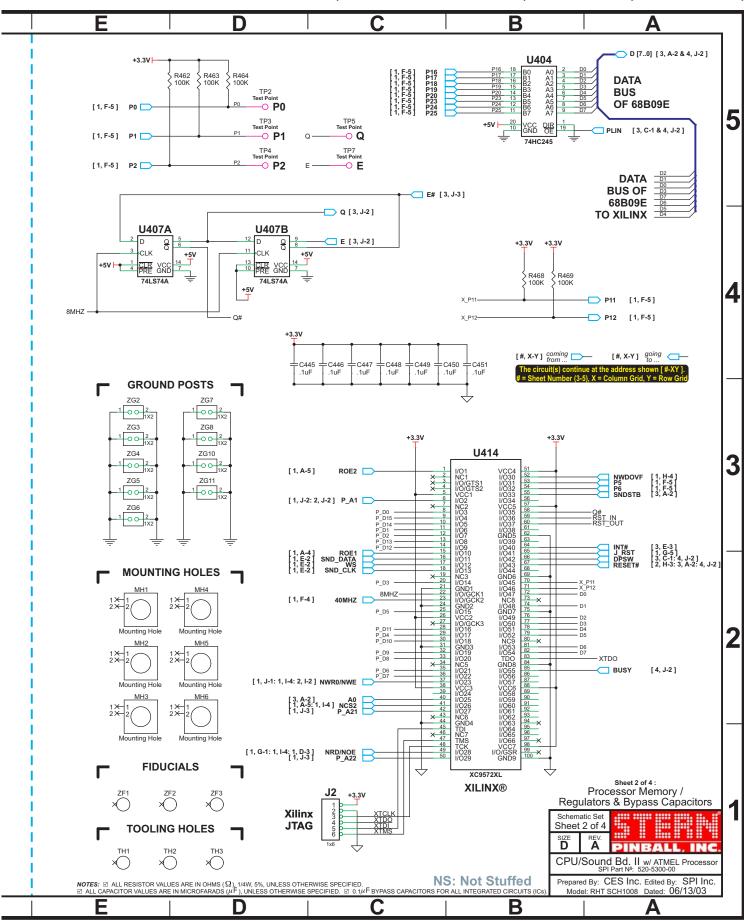


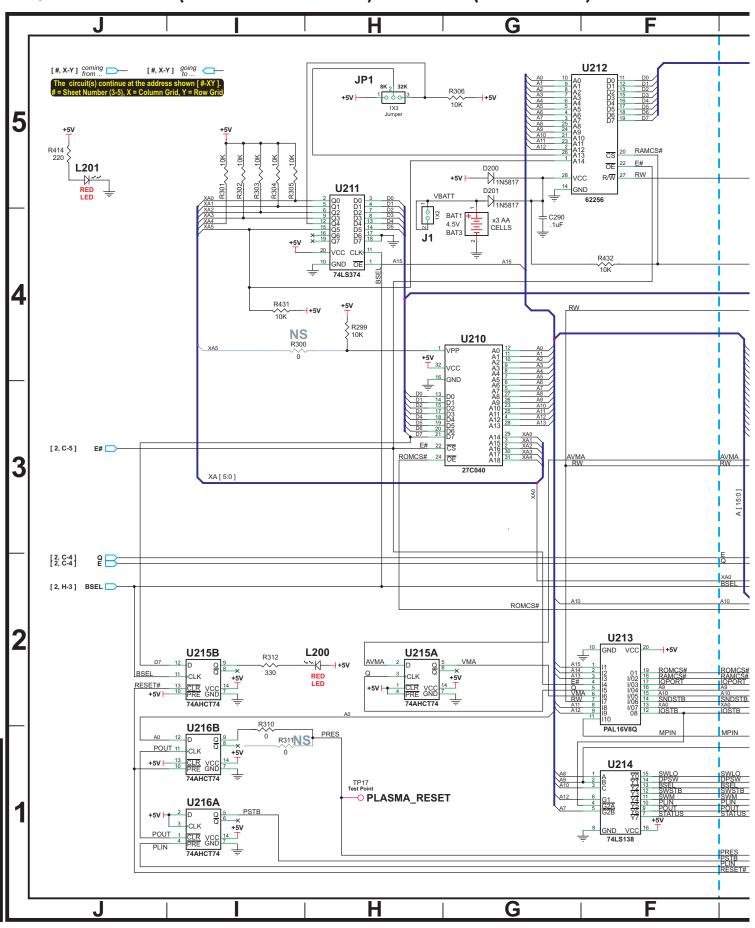


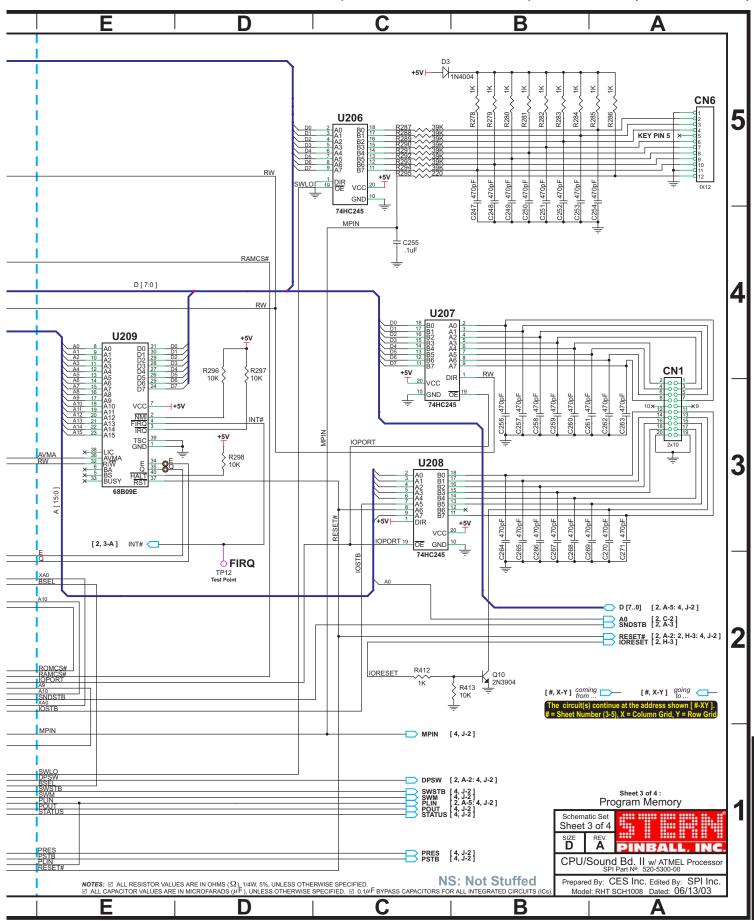


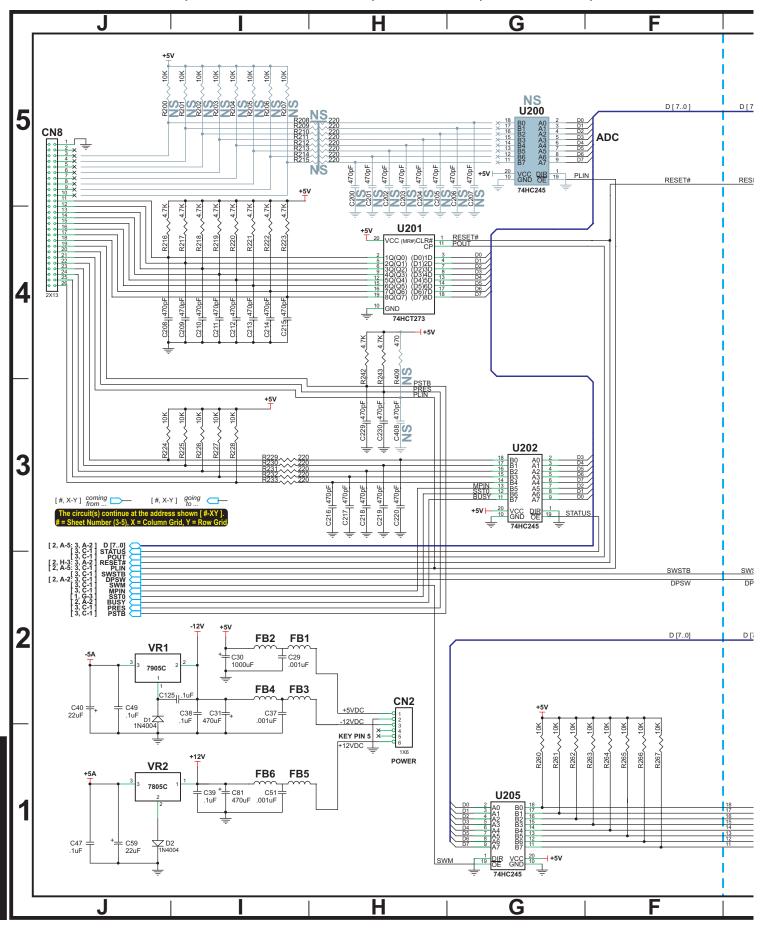




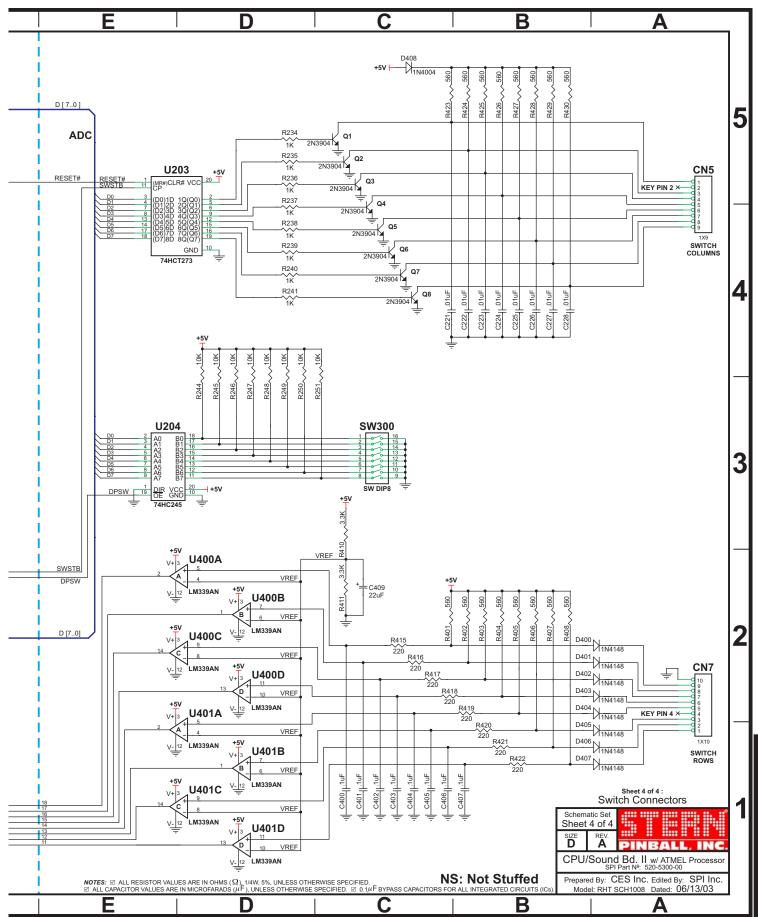


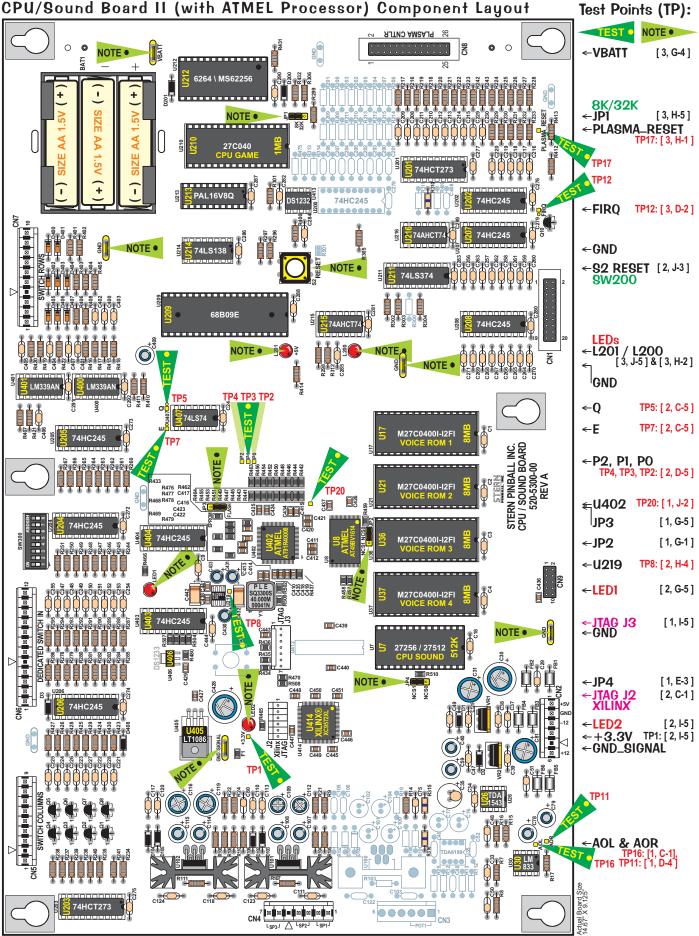


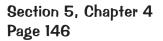




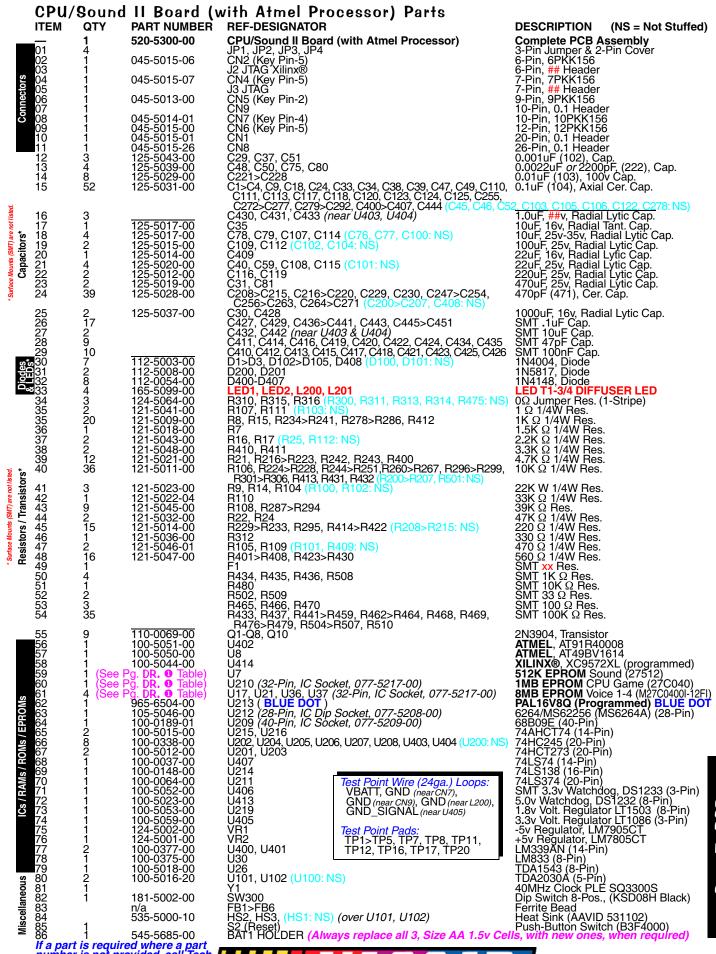












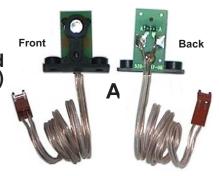
If a part is required where a part number is not provided, call Tech. Support (see back of cover).

Printed Circuit

Boards (PCBs)



Mini PCB OPTO 12" Lead (Black Bracket) 500-6775-00

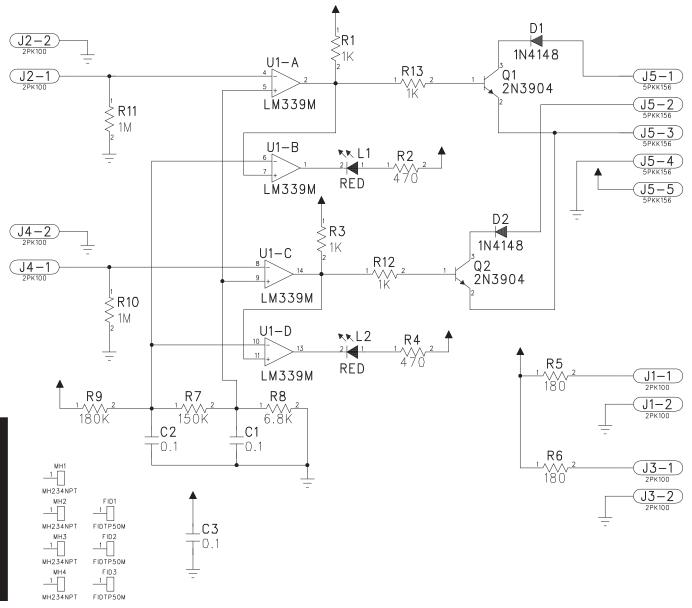


ITEM	QTY	PART NUMBER	REF-DESIGNATOR
A 01 02 03 04	16 1 1 1 1	500-6775-00 520-5237-00 545-6092-00 237-5909-00 165-5052-00 601-5023-12	MINI PCB OPTO ASM WHT / 12" LEAD Mini OPTO Trans. or Rec. Board K, A
05	1	045-5020-02	Note White Strip to Pin-1

DESCRIPTION

PCB Assy. (with all Items 1-5)
PCB Only Plain
Black Bracket (Plastic) Holder
#4-40 X 1/4 PPH Screw
LED (Ultra Bright Red)
12" Speaker Wire (1-Side White Stripe)
2-Pin Cn., .100 кк смр тгм Molex 08-50-0113

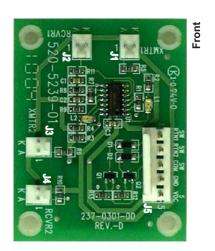
Playfield OPTO Transmitter / Receiver Amplifier Board Schematic

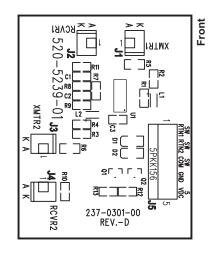


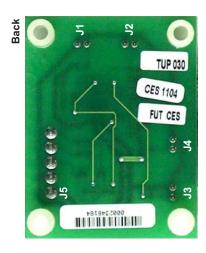
Section 5, Chapter 4 Page 148



Playfield OPTO Transmitter/Receiver Amplifier Board Component Layout & Parts (for OPTO Switches 20, 21, 32, 34, 35, 37, 47 & 48: see Wiring Configurations #1-#5)





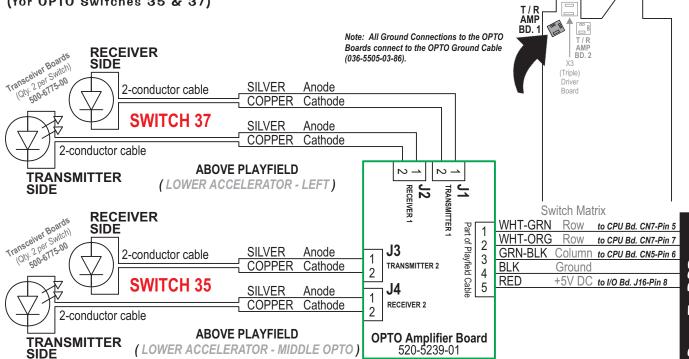


ITEM QTY PART NUMBER REF-DESIGNATOR	
The image is a second color of the image is a second color o	r Amplifier Board

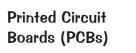
DESCRIPTION

Complete PCB Assembly SMT 150K Ω 1/10W Resistor 805, 5% SMT 180 Ω 1/10W Resistor 805, 5% SMT 180K Ω 1/10W Resistor 805, 5% SMT 180K Ω 1/10W Resistor 805, 5% SMT 1M Ω 1/10W Resistor 805, 5% SMT 1M Ω 1/10W Resistor 805, 5% SMT 470 Ω 1/10W Resistor 805, 5% SMT 6.8K Ω 1/10W Resistor 805, 5% SMT 6.8K Ω 1/10W Resistor 805, 5% SMT Cer. 1uF 50v Cap., 10% X7R 1N4148W, Diode, 100v, 350MW MMST3904, NPN, 40v, .02A LM339M, Low Power Offset QUA 2-Pin, 0.1 Header (1 Row, VT, Tin) 5-Pin, .156 Header (1 Row, VT, Tin) LEDD-SMT, Red 1206 Spacer (Nylon), .153" ID X 9/32" 0D X 3/8"

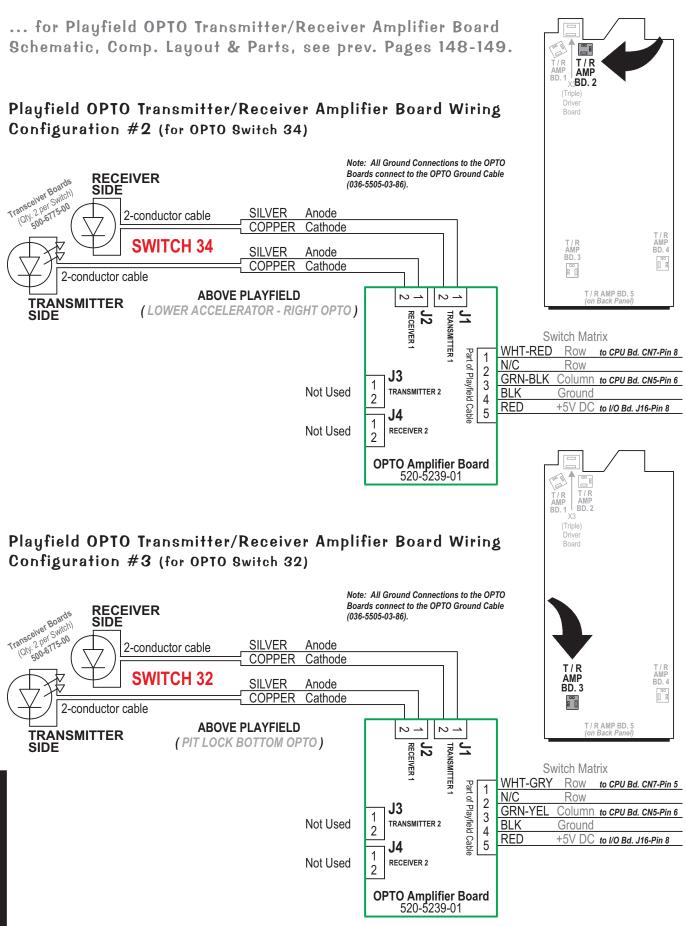
Playfield OPTO Transmitter/Receiver Amplifier Board Wiring Configuration #1 (for OPTO Switches 35 & 37)



Wiring Configurations #2-#3 on Page 150; Wiring Configurations #4-#5 on Page 151







Wiring Configuration #1 on Page 149; Wiring Configurations #4-#5 on Page 151



Wiring Configuration #1 on Page 149; Wiring Configurations #2-#3 on Page 150

Cathode

RECEIVER 2

OPTO Amplifier Board

520-5239-01

2



COPPER

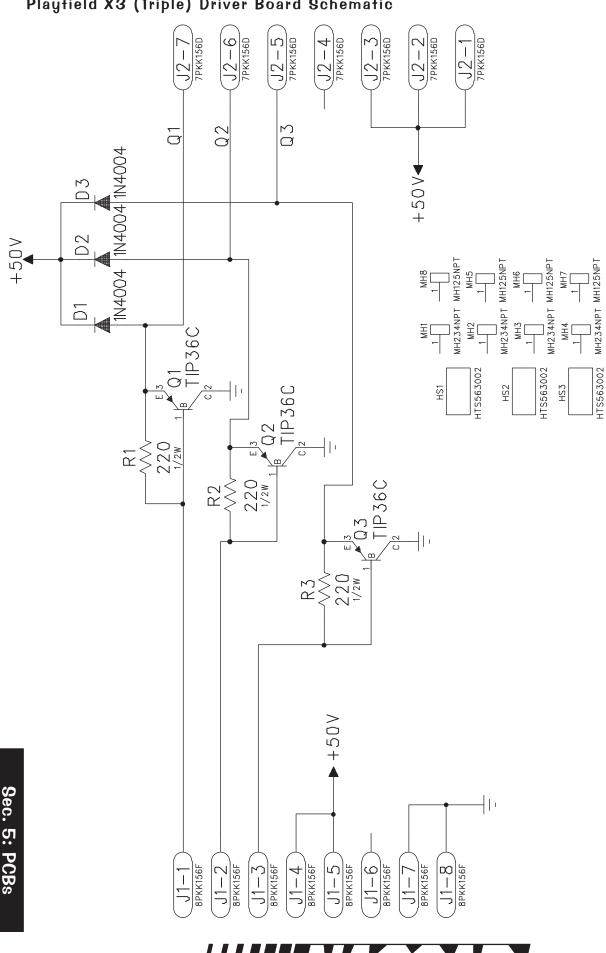
ABOVE PLAYFIELD

(WINDMILL MOTOR OPTO)

SIDE

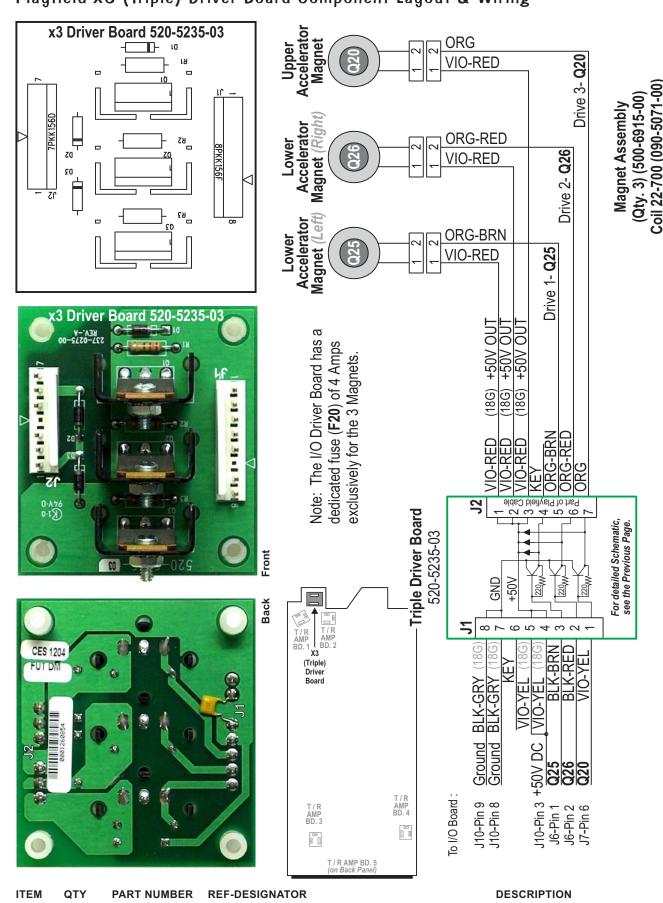
2-conductor cable

TRANSMITTER





HTS563002



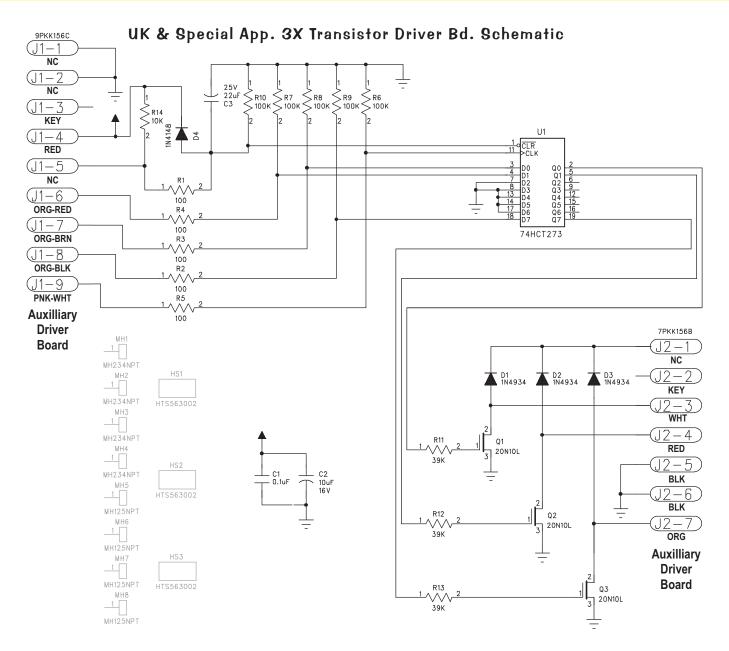
Printed Circuit Boards (PCBs)

520-5235-03

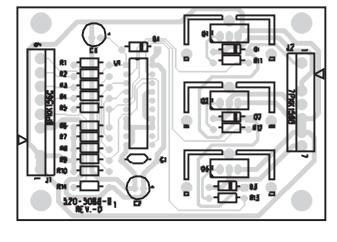


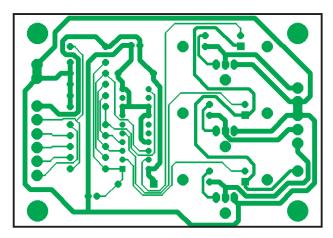
Playfield X3 (Triple) Driver PC Board

Complete PCB Assembly



UK & Special App. 3X Transistor Driver Bd. Component Layout (Sol. Exp. Bd.)





ITEM QTY
— 1

PART NUMBER 520-5068-01

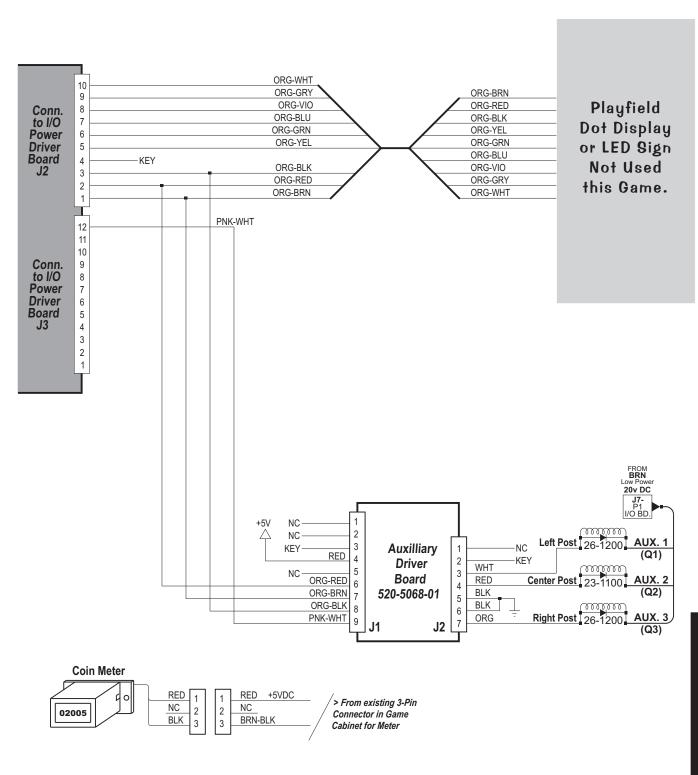
REF-DESIGNATOR
Solenoid Expander (x3 Transistor) PC Board

DESCRIPTION
Complete PCB Assembly

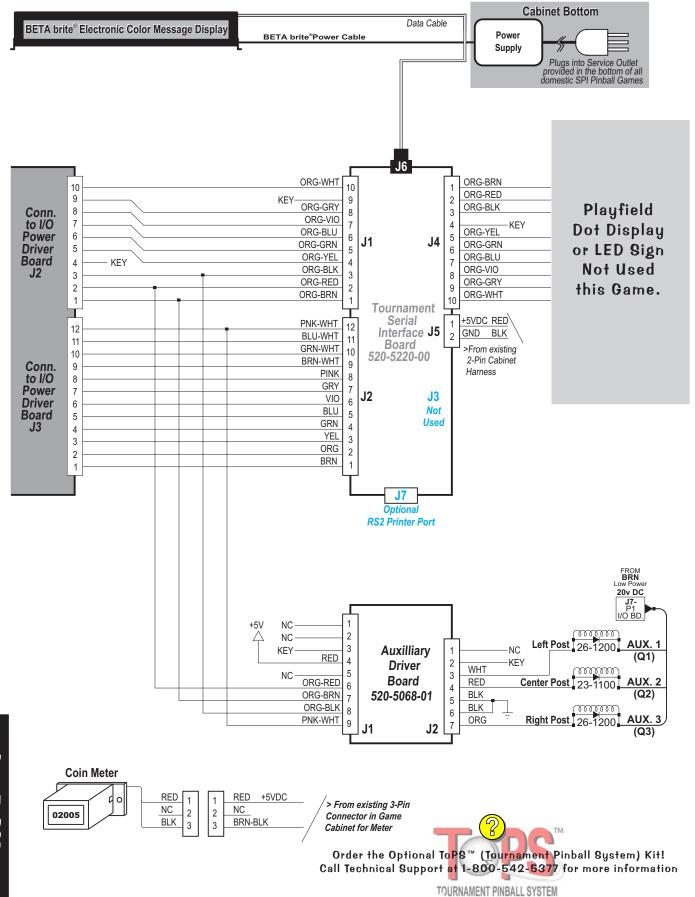
Section 5, Chapter 4 Page 154



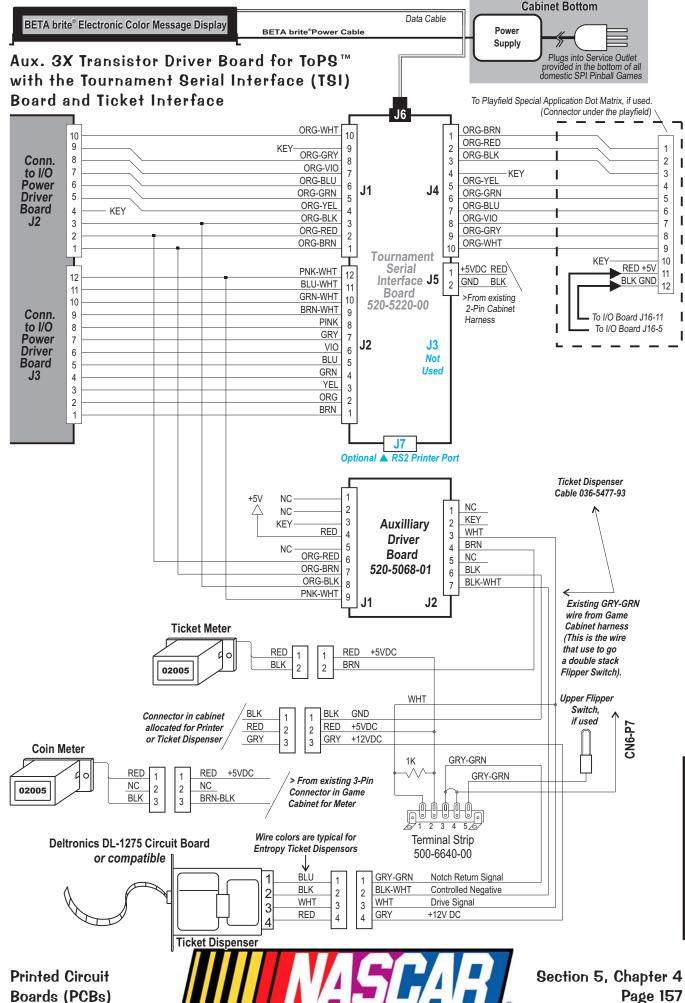
Printed Circuit Boards (PCBs)



UK 3X Transistor Driver Board for Up-Posts & P/F Dot Display or LED Sign (if used) with the Tournament Serial Interface (TSI) Board

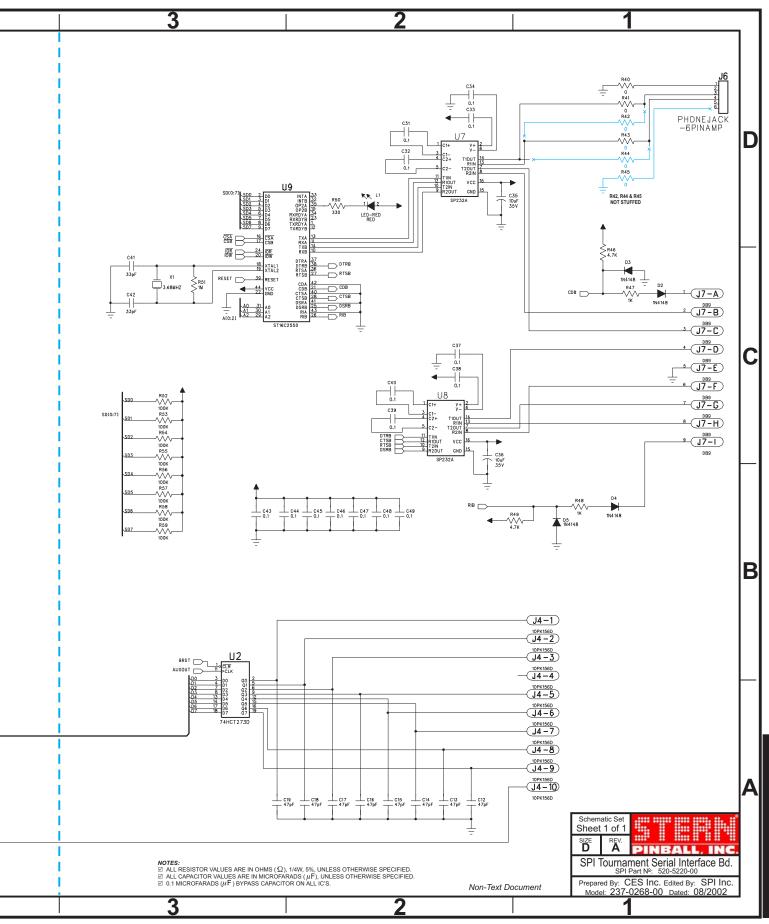






Section 5, Chapter 4 Page 158





Section 5, Chapter 4 Page 160



Appendixes A through J

Table of Contents for Appendixes

 Appendix A: Pinball Game Firmware Table I White Star Board System and S.A.M. System Only*] ∴ describes the ROM / Chip Size / Program & Raw Part Number / USA Version / Check Sum and CPU/Sound PCB & II ROM locations for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games).
 Appendix B: Semi-Conductors / I.C.'s / Relays Cross-Reference Table describes diodes and transistors with Source Number, SPI Part Number, NTE Number, ECG Number, Radio Shack Number & RCA Part Number (If applicable).
 Appendix C: Production Start Date, Manual Part No, ROM Size & Positions and Jumper W6C ► [White Star Board System and S.A.M. System Only*] □provides the Production Start Date, Manual Part Number, ROM Position(s), and Jumpers Installed for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games).
• Appendix D : Board TyPe Table
▶ [White Star Board System and S.A.M. System Only*] ▷provides the Flipper**, I/O Power Driver, CPU/Sound, Display Power Supply, Dot Matrix Display, Display Controller, OPTOs and Misc. Board Part Numbers for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games). **Flipper Bd. with White Star Bd. System for A13 & Golden Eye only.)
 Appendix E: Generic Coil Cross-Reference Guide & Flipper Coil Table
 Appendix F: Motor Specification Table F1-F2 ► [White Star Board System and S.A.M. System Only*] □provides all the Motor Function, Specifications and Part Number for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games)
• Appendix G: Part Number Prefix Classification Codes
 Appendix H: Playfield Inserts (Plastic Light Covers) gives a pictoral view with the name and Part Nr. of all the inserts used (with Color Code Chart).
 Appendix I: Stand-Up Targets & Modular Stand-Up Targets gives a pictoral view with the name and Part Number of all the Single Stand-Up Targets used (with Color Code Chart).
Appendix J: Coin Cards (USA & International)





Pinball Game Firmware (White Star Board System* Only) Table See website for the latest International Code or Updated USA version / checksums



ROM	Chip Size	Program Part Nº	USA ver. & Check Sum	Bd. Loc.	Raw Part Nº	ROM	Chip Size	Program Part Nº	USA ver. & Check Sum	Bd. Loc.	Raw Part Nº
						Harley-I Game R Sound Display Voice 1 Voice 2 Voice 3 Voice 4	Davidson@ OM (1M) (512K) (4M) (8M) (8M) (8M) (4M)	9(Notes 4, 5 965-0319-67 965-0320-67 965-0321-67 965-0322-67 965-0323-67 965-0325-67	5, 6) Original A1.03 \$3EFF 1.00 \$F4FF A1.04 \$FC7C 1.00 \$C026 1.00 \$9396 1.00 \$FB72 1.00 \$6100	(1999-200 U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00 960-5015-01
Apollo 13 (Game ROM Sound Display Voice 1 Voice 2 Voice 3		965-0208-00 965-0212-00 965-0213-00 965-0209-00 965-0210-00 965-0211-00	A5.01 \$09FF 1.00 \$5244 A5.00 \$B92B 1.00 \$7FC7 1.00 \$8E55 1.00 \$08EE	U210 U7 ROM 0 U17 U21 U36	960-5009-00 960-7001-02 960-5015-01 n/a (masked) n/a (masked) n/a (masked)	Game R Display ► Harl Game R Display	OM (1M) (4M) ey-Davidso OM (1M) (4M)	965-0319-67A 965-0321-67A n® (Notes 4, 965-0319-87 965-0321-87	5, 6, 8) <i>2nd Edi</i>	tion (2002- U210 ROM 0	2003) 960-5009-00 960-5015-01 960-5009-00 960-5015-01
Golden Eye Game ROM Sound Display Voice 1 Voice 2	(1M) (512K) (4M) (4M) (4M)	965-0214-42 965-0217-42 965-0218-42 965-0215-42 965-0216-42	A4.04 \$3FFF 1.00 \$D615 A4.00 \$E6ED 1.00 \$3E32 1.00 \$71F0	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 n/a (masked) n/a (masked)	Striker 2 Game R Sound Display Voice 1 Voice 2 Voice 3 Voice 4	Xtreme (N OM (1M) (512K) (4M) (8M) (8M) (8M) (8M)	otes 4, 5) 965-0326-68 965-0327-68 965-0328-68 965-0329-68 965-0330-68 965-0331-68 965-0332-68	A1.03 \$E4FF 1.00 \$3BCA A1.03 \$1957 1.00 \$482A 1.00 \$7312 1.00 \$DE2F 1.00 \$C508	U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-00 960-5016-00 960-5016-00 960-5016-00
Twister (No Game ROM Sound Display Voice 1 Voice 2	(1M) (512K) (4M) (4M) (4M)	965-0219-41 965-0221-41 965-0222-41 965-0220-41 965-0223-41	A4.05 \$E9FF 1.00 \$1FFF A4.00 \$FD01 1.00 \$3650 1.00 \$9300	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	NFL (No Game R Sound Display Voice 1 Voice 2 Voice 3		Not on CD-R or 965-0339-73 965-0340-73 965-0341-73 965-0342-73 965-0343-73 965-0344-73	Mebsite: Code (A1.00 \$D2FF 1.00 \$ A1.01 \$845A 1.00 \$ 1.00 \$ 1.00 \$	through Dist	
Game ROM Sound Display Voice 1 Voice 2	(1M) (512K) (4M) (4M) (4M)	965-0224-45 965-0227-45 965-0228-45 965-0225-45 965-0226-45	A2.02 \$9CFF 1.00 \$222B A2.00 \$ABF7 1.00 \$3AE1 1.00 \$206E	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	Voice 4	's Shoote	965-0333-72 965-0333-72		U210 U7 ROM 0	960-5009-00 960-7001-02
Space Jam Game ROM Sound Display Voice 1 Voice 2 Voice 3	(1M) (512K) (4M) (4M) (4M) (4M) (4M)	965-0229-43 965-0233-43 965-0234-43 965-0230-43 965-0231-43 965-0232-43	A3.00 \$E6FF 1.00 \$F1E7 A3.00 \$0057 1.00 \$DBA8 1.00 \$DDF1 1.00 \$F32A	U210 U7 ROM 0 U17 U21 U36	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01	Voice 2 Voice 3	(8M) oller Casin	965-0335-72 965-0336-72 965-0337-72 965-0338-72 965-0348-65 965-0346-65 965-0347-65 965-0348-65	5)	U21 U36	960-5015-01 960-5016-00 960-5016-00 960-5016-00 960-5009-00 960-7001-02 960-5015-01
The Star W Game ROM Sound Display Voice 1 Voice 2	/ars Tril (1M) (512K) (4M) (4M) (4M)	ogy - Speci 965-0235-56 965-0238-56 965-0239-56 965-0236-56 965-0237-56	al Edition (S. A4.03 \$5EFF 1.00 \$4A7D A4.00 \$8817 1.00 \$866B 1.00 \$8F54	E.) (Not U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	Voice 1 Voice 2 Voice 3 Voice 4	(8M) (8M) (8M) (8M) Powers TM	965-0349-65 965-0350-65 965-0351-65 965-0352-65	A3.00 \$90FF 1.00 \$581C A3.00 \$74B3 1.00 \$E12D 1.00 \$38F4 1.00 \$1B54 1.00 \$D720		960-5016-00 960-5016-00 960-5016-00 960-5016-00
The Lost V Game ROM Sound Display Voice 1 Voice 2		urassic Par 965-0240-53 965-0243-53 965-0244-53 965-0241-53 965-0242-53	k (Note 2) A2.02 \$C8FF 1.00 \$A35B A2.01 \$7F46 1.00 \$1D27 1.00 \$8DA4	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	Sound Display Voice 1 Voice 2 Voice 3 Voice 4	(512K) (4M) (8M) (8M) (8M) (8M)	965-0354-74 965-0335-74 965-0356-74 965-0357-74 965-0358-74 965-0359-74	A3.02 \$5DFF 1.00 \$DA7B A3.00 \$6A34 1.00 \$02B9 1.00 \$9E75 1.00 \$51F3 1.00 \$0AE5	U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00
The X-Files Game ROM Sound Display Voice 1 Voice 2		965-0245-46 965-0248-46 965-0249-46 965-0246-46 965-0247-46	A3.03 \$A2FF 1.00 \$6648 A3.00 \$66D0 1.00 \$349D 1.00 \$629C	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	MONOF Game R Sound Display Voice 1 Voice 2 Voice 3	OLY® (No OM (1M) (512K) (4M) (8M) (8M) (8M)	965-0360-75 965-0361-75 965-0362-75 965-0363-75 965-0364-75 965-0365-75	A3.20 \$07FF 1.00 \$8C18 A3.01 \$A381 1.00 \$35E6 1.00 \$835A 1.00 \$8A9F	U210 U7 ROM 0 U17 U21 U36	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00
Starship To Game ROM Sound Display Voice 1 Voice 2 Voice 3	(512K) (4M) (4M) (4M) (4M)	965-0253-59 965-0254-59 965-0251-59 965-0252-59 965-0255-59	A2.00 \$85FF 1.00 \$64B2 A2.00 \$577B 1.00 \$152A 1.00 \$0291 1.00 \$95A7	U210 U7 ROM 0 U17 U21 U36	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01	Playboy Game R Sound Display Voice 1 Voice 2 Voice 3 Voice 4	V (Notes 4, OM (1M) (512K) (4M) (8M) (8M) (8M) (8M)	5, 7) 965-0367-76 965-0368-76 965-0369-76 965-0370-76 965-0371-76 965-0372-76 965-0373-76	A5.00 \$7DFF 1.02 \$E7C2 A5.00 \$A5FF 1.00 \$9ABE 1.00 \$9734 1.00 \$374B 1.00 \$237A	U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00 960-5016-00
Viper Nigh Game ROM Sound Display Voice 1 Voice 2 Voice 3 Voice 4		965-0266-35 965-0271-35 965-0272-35 965-0267-35 965-0268-35 965-0269-35 965-0270-35	A2.01 \$C5FF 1.00 \$4DF8 A2.01 \$C17D 1.00 \$8018 1.00 \$2157 1.00 \$B5A6 1.00 \$D01E	U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01 960-5015-01	RollerC Sound Game R Voice 1 Voice 2 Voice 3 Display	(512K)	965-0374-78 965-0375-78 965-0377-78 965-0377-78 965-0378-78 965-0379-78 965-0376-78	es 4, 5, 7) 1.00 \$F663 A7.02 \$E5FF 1.00 \$3C4A 1.00 \$057A 1.00 \$04D7 A7.01 \$8DDB	U7 U210 U17 U21 U36 U5 Disp. C	960-7001-02 960-5009-00 960-5016-00 960-5016-00 960-5016-00 ntrlr.
Lost In Spa Game ROM Sound Display Voice 1 Voice 2 Voice 3 Voice 4		965-0282-60 965-0287-60 965-0288-60 965-0288-60 965-0284-60 965-0285-60 965-0286-60	A1.01 \$B2FF 1.00 \$A6AF A1.02 \$32AB 1.00 \$4391 1.00 \$6215 1.00 \$5B32 1.00 \$8971	U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01 960-5015-01	The Sim Sound Game R Voice 1 Voice 2 Voice 3 Voice 4 Display	(512K)	inball Party 965-0381-77 965-0382-77 965-0383-77 965-0384-77 965-0385-77 965-0386-77 965-0387-77	(Notes 4, 5, 7 1.01 \$A7EE A4.00 \$4FFF 1.00 \$9719 1.00 \$16ED 1.00 \$ADCE 1.00 \$E7E5 A4.00 \$8A03	7\	960-7001-02 960-5009-00 960-5016-00 960-5016-00 960-5016-00 960-5015-01 B 960-5015-01
Godzilla (N Game ROM Sound Display Voice 1 Voice 2 Voice 3 Voice 4		965-0289-40 965-0294-40 965-0295-40 965-0290-40 965-0291-40 965-0292-40 965-0293-40	A2.05 \$B1FF 1.00 \$0CC8 A2.00 \$C929 1.00 \$0D75 1.00 \$CCCF 1.00 \$227F 1.00 \$DB69	U210 U7 ROM 0 U17 U21 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01 960-5015-01	Termina Sound Game R Voice 1 Voice 2 Voice 3 Voice 4 Display	(512K)	965-0388-79 965-0389-79 965-0390-79 965-0390-79 965-0392-79 965-0393-79 965-0394-79	Achines TM (N 1.00 \$D2FD A4.00 \$F8FF 1.00 \$1838 1.00 \$1905 1.00 \$89DA 1.00 \$1200 A4.00 \$6E49	otes 4, 5, U7 U210 U17 U21 U36 U37	7) 960-7001-02 960-5009-00 960-5016-00 960-5016-00 960-5016-00 960-5015-01
South Park Game ROM Sound Display Voice 1 Voice 2 Voice 3 Voice 4		965-0301-71 965-0306-71 965-0307-71 965-0302-71 965-0303-71 965-0304-71 965-0305-71	A1.03 \$58FF 1.00 \$1286 A1.01 \$166F 1.00 \$7BF8 1.00 \$9CCC 1.00 \$ADD9 1.00 \$6659	U210 U7 ROM 0 U17 U21 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00 960-5016-00	The Lor Sound Game R Voice 1 Voice 2 Voice 3 Voice 4 Display	(512K)	ings TM (Note 965-0401-80 965-0402-80 965-0403-80 965-0404-80 965-0406-80 965-0407-80		U7 U210 U17 U21 U36 U37 U5 DC PC	960-7001-02 960-5009-00 960-5016-00 960-5016-00 960-5016-00 960-5016-00 B 960-5015-01





🛚 Pinball Game Firmware (White Star Board System* & S.A.M. System** Only) Table 🛒 🕍 ode or Updated USA version / checksums

٧		See web			
ROM	Chip Size	Program Part Nº	USA ver. & Check Sum	Bd. Loc.	Raw Part Nº
pley's Be	lieve It	t or Not!® (N	lotes 7, 8)	117	000 7001 00
Sound Game ROM	(512K) (1M)	965-0408-81 965-0409-81	1.00 \$D93D A3.20 \$43FF 1.00 \$067B 1.00 \$C8B8 1.00 \$64C2 1.00 \$5341	U7 U210	960-7001-02 960-5009-00 960-5016-00
Game ROM Voice 1 Voice 2	(1M) (8M) (8M)	965-0409-81 965-0410-81 965-0411-81	1.00 \$067B	Ü210 U17 U21	960-5016-00
Voice 2 Voice 3	(8M)	965-0411-81	1.00 \$C8B8	U36 U37	960-5016-00
Voice 3 Voice 4	(8M) (8M) (4M)	965-0412-81 965-0413-81 965-0414-81	1.00 \$5341 A3.00 \$DE4B	U37	960-5016-00 960-5016-00 960-5016-00 960-5015-01
Display			A3.00 \$DE4B	US DC PC	3 960-3013-01
vis® (Not Sound	(512K)	965-0415-84	1.00 \$8CD2	U7	960-7001-02
Game ROM	(1M) (8M)	965-0416-84 965-0417-84	A5.00 \$50FF	Ŭ210 U17 U21	960-7001-02 960-5009-00 960-5016-00
Voice 1 Voice 2	(MA)	965-0418-84	1.00 \$538D 1.00 \$8BCD	U21	960-5016-00
Voice 3 Voice 4	(8M) (8M)	965-0419-84	1.00 \$8CD2 A5.00 \$50FF 1.00 \$538D 1.00 \$8BCD 1.00 \$60F8 1.00 \$14D8	Ú36	960-5016-00
Display	(4M)	965-0420-84 965-0421-84	1.00 \$8CD2 A5.00 \$50FF 1.00 \$538D 1.00 \$8BCD 1.00 \$60F8 1.00 \$14D8 A5.00 \$A1F6	U5 DC PCE	960-5016-00 960-5016-00 960-5016-00 3 960-5015-01
e Soprar	nos sm (N	lotes 7. 8)			
Sound	(512K) (1M)	Notes 7, 8) 965-0422-85 965-0423-85	4.00 \$9B5A A5.00 \$5BFF	U7	960-7001-02
Game ROM	(IM) (8M)	965-N/2/I-85	3.00 \$5BFF	Ú210 U17	960-5009-00 960-5016-00
Voice 1 Voice 2 Voice 3	(8M)	965-0425-85	3.00 \$F01E 1.04 \$C14C 1.04 \$47A3	Ü21	960-5016-00
Voice 3 Voice 4	(8M) (8M) (8M) (8M)	965-0425-85 965-0426-85 965-0427-85	1 ()4 SAD(3)	U17 U21 U36 U37	960-5016-00 960-5016-00 960-5016-00 960-5016-00
Display	(4M)	965-0428-85	A5.00 \$B4BB	ŬŠ DC PCE	3 960-5015-01
ASCAR®	(Notes	7, 8)			
Sound Game ROM	(512K) (1M)	965-0429-86 965-0430-86	2.00 \$32B3 A4.50 \$39FF 2.00 \$CFFB 2.00 \$22C0 2.00 \$5FC8 2.00 \$2902	U7 U210	960-7001-02 960-5009-00
Voice 1	(M8)	965-0431-86	2.00 SCFFB	U17	
Voice 1 Voice 2 Voice 3	(8M) (8M) (8M) (8M)	965-0431-86 965-0432-86 965-0433-86 965-0434-86	2.00 \$22C0 2.00 \$5FC8	U17 U21 U36 U37	960-5016-00 960-5016-00
Voice 4	(8M)	965-0434-86	2.00 \$2902	U37	960-5016-00
Display	(4M)	965-0435-86	A4.00 \$92BD	US DC PC	3 960-5015-01
and Prix	(Notes	7, 8)	V1 00 ¢6E90	U7	960-7001-02
Sound Game ROM	(512K) (1M)	965-0429-91 965-0430-91	V1.00 \$6F89 A4.50 \$5EFF 1.00 \$CE0E 1.00 \$F4C6 1.00 \$057D 1.00 \$2646	11210	960-5009-00
Voice 1	(M8)	965-0431-91	1.00 \$CE0E	U17	960-5016-00
Voice 1 Voice 2 Voice 3	(8M) (8M) (8M)	965-0432-91 965-0433-91 965-0434-91	1.00 \$F4C6	U17 U21 U36 U37	960-5016-00 960-5016-00 960-5016-00
Voice 4	(8M) (4M)	965-0434-91 965-0435-91	A4.50 \$5EFF 1.00 \$CEOE 1.00 \$F4C6 1.00 \$057D 1.00 \$2646 A4.00 \$DA8E	U37	960-5016-00 3 960-5015-01
Display					
DSE] (No	(512K)	965-0436-97	ore info if co	U7	e required.
Sound Game ROM	(512K) (1M)	965-0436-97 965-0437-97		U210	960-7001-02 960-5009-00
Voice 1 Voice 2	(8M) (8M)	965-0438-97		U17 U21	960-5016-00
Voice 3	(8M)	965-0439-97 965-0440-97		U36	960-5016-00 960-5016-00
Voice 4 Display	(8M) (4M)	965-0441-97 965-0442-97		U37 U5 DC PCE	960-5016-00 3 960-5015-01
	` '		/T 001 11111 4 F		
GAMES B	ELOW I	HIS LINE / NE)	CT COLUMN AF	E S.A.W. S	YSTEM GAME
0.000			OTIOIC SAL		
			STICK W		
FROM	YOU	IR DISTR	IBUTOR,	USE SI	PI PART
FROM NUM	YOU BER	IR DISTR 970-012	IBUTOR, 8-00 &	USE SI	PI PART DE THE
FROM	YOU BER	IR DISTR 970-012	IBUTOR,	USE SI	PI PART
FROM NUM	YOU BER	IR DISTR 970-012	IBUTOR, 8-00 &	USE SI	PI PART DE THE
FROM NUM	YOU BER	IR DISTR 970-012	IBUTOR, 8-00 &	USE SI	PI PART DE THE
FROM NUM GAME	YOU BER NAM er Tour	IR DISTR 970-012 E / LANG	IBUTOR, 8-00 & UAGE FIL WPT) (Notes	USE SI INCLUD E(S) D	PI PART DE THE ESIRED.
FROM NUM GAME orld Poke Boot B-02	YOU BER NAM er Tour (8M)	Pinball (V 965-BOOT-SA	IBUTOR, 18-00 & UAGE FIL WPT) (Notes M 1.04 \$7562	USE SI INCLUIC E(S) D	PI PART DE THE ESIRED.
FROM NUM GAME orld Poke Boot B-02	YOU BER NAM er Tour (8M) kk 128MB	Pinball (V 965-B00T-SA (970-0128-00)	IBUTOR, 8-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version	USE SINCLUDE(S) D	PI PART DE THE ESIRED.
FROM NUM GAME orld Poke Boot B-02	PER NAM PER TOUT (8M) Rk 128MB English	IR DISTR 970-012 E / LANG TM Pinball (V 965-BOOT-SA (970-0128-00) + Spanish Profiles Only	BUTOR, 8-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version 1.12AL	USE SI INCLUID E(S) D 7, 9) U9 System 1.17+ 1.17+	PI PART DE THE ESIRED.
FROM NUM GAME orld Poke Boot B-02	PER NAM PER TOUT (8M) Rk 128MB English	IR DISTR 970-012 E / LANG TM Pinball (V 965-BOOT-SA (970-0128-00) + Spanish Profiles Only	IBUTOR, 28-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version 1.12AL 1.12A 1.12A 1.13AF	USE SI INCLUID E(S) D 7, 9) U9 System 1.17+ 1.17+	PI PART DE THE ESIRED. 960-5016-00 unprogramme Bin Files: WPT0112A-bit WPT0112A-bit WPT0112F-bit WPT0112F-bit
FROM NUM GAME orld Poke Boot B-02	YOU BER NAM er Tour (8M) ek 128MB English	Pinball (V 965-B0012-S) Pinball (V 965-B0013-S) (970-0128-S) (970-013-S) English Only French Only French Only French Only	IBUTOR, 28-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version 1.12AL 1.12A 1.12A 1.13AF	USE SI INCLUID E(S) D 7, 9) U9 System 1.17+ 1.17+ 1.17+ 1.17+	PI PART DE THE ESIRED. 960-5016-00 unprogramme Bin Files: WPT0112A-bit WPT0112A-bit WPT0112F-bit WPT0112F-bit
FROM NUM GAME orld Poke Boot B-02	YOU BER NAM er Tour (8M) ek 128MB English	IR DISTR 970-012 E / LANG TM Pinball (V 965-BOOT-SA (970-0128-00) + Spanish English Only + French French Only + French German Only	BUTOR, 8-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version 1.12AL	USE SI INCLUID E(S) D 7, 9) U9 System 1.17+ 1.17+	PI PART DE THE ESIRED.

SKC0105.bin SKC0090NJ.bin

System 1.23+ 1.23+ 1.23+ 1.23+

960-5016-00 unprogrammed

960-5016-00 unprogrammed Bin Files: POTC115AS.bin POTC115GF.bin POTC115AI.bin

960-5016-00 unprogrammed Bin Files: FG1000AL.bin FG1000AF.bin FG1000AI.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB - 30MB+/-The SimpsonsTM Kooky Carnival Redemption (Note 9)
Boot B-02 (8M) 965-BOOT-SAM 1.04 | \$7E62 U9

©Disney's Pirates of the Caribbean Pinball (POTC) (Notes 7, 9)

Boot B-02 (8M) 965-BOOT-SAM 1.06 | \$2014 U9 960-5016-00

Version 10.00AL 10.00AF 10.00AG 10.00AI

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB - 30MB+/-

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB - 30MB+/-

Family Guy™ Pinball (FG) (Notes 7, 9)

Boot B-02 (8M) 965-BOOT-SAM 2.09 | \$10A3 U9

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 5.5MB +/-

 Memory Stick 128MB (970-0128-00)
 Version

 English Only
 1.05

 English New Jersey Only
 0.09NJ

Memory Stick 128MB (970-0128-00) English + Spanish English + French German + French English + Italian

Memory Stick 128MB (970-0128-00)
English + Spanish
English + French
English + German
English + Italian

Boot B-02 (8		OOT-SAM 2		960-5016	
Er Ge	28MB (970-01 nglish + Spanis nglish + French erman+French nglish + Italian	sh [*] 1.31 1 1.31	EF 1.27 GF 1.27	+ spd_1_30 + spd_1_30 + spd_1_30	: _es.bin ef.bin
NOTE: THE TY	PICAL SIZE	PER UNZIPPE	D BIN FILE IS 251	MB - 30MB+/-	

 Spider-Man™ Pinball (S-M) (Notes 7, 9)

 Boot B-02 (8M)
 965-B00T-SAM 2.10 | \$F625 U9

footnotes:

ROMs on CPU/Sound Bd.: 520-5136-**00** (Stereo) & Display Cont. Bd.: 520-5055-01 ROMs on CPU/Sound Bd.: 520-5136-**10** (Mono) & Display Cont. Bd.: 520-5055-01 ROMs on CPU/Sound Board: 520-5136-**15** (Mono) (*FCC 11-97) & Display Controller Board: 520-5055-**02*** (*FCC 11-97)





Pinball Game Firmware Table

EDDOM	Chip	Program	USA	Bd.	inball Game F		Chip	Program	USA Von	Bd.	Raw Don't No
EPROM Laser War CPU Sound (Old) Sound (Old) Sound (Old)	(256K) (256K) (256K) (256K)	965-0004-00 965-0005-00 965-0006-00 965-0007-00	Ver. LWAR.C5	C5 J5 J6 J7	Part № 960-5007-00 960-5007-00 960-5007-00 960-5007-00	EPROM Lethal Wea CPU Voice 1 Voice 2 Sound	9ize apon 3 (512K) (2M) (2M) (256K)	965-0082-00 965-0083-00 965-0084-00 965-0085-00 965-0086-00 965-0087-00 n Display PCB 55	Ver. A2.08	C5 U17 U21 U7	960-7001-02 960-5010-00 960-5010-00 960-5007-00 960-5010-00 960-5010-00
Sound 1 Sound 2	(256K) (512K) (512K)	965-0008-00 965-0009-00 965-0010-00	- OR -	7F 6F 4F	960-5007-00 960-7001-02 960-7001-02	Display Display Display		965-0086-00 965-0087-00 n Display PCB 5: 965-0087-04 n Display PCB 5:	-OR-	ROM 0 ROM 1	960-5010-00 960-5010-00 960-5015-00
CPU CPU Voice 1 Voice 2 Sound	(256K) (256K) (512K) (512K) (512K) (256K)	965-0011-00 965-0012-00 965-0014-00 965-0015-00 965-0013-00	A4-6 A4-6	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Star Wars CPU Voice 0 Voice 1 Sound	(512K) (4M)	965-0119-00 965-0132-00	A1.03	C5 U17 U21 U7	960-7001-02 960-5015-00 960-5010-00 960-5007-00
CPU CPU Voice 1 Voice 2 Sound	(256K) (256K) (512K) (512K) (512K) (256K)	965-0016-00 965-0017-00 965-0019-00 965-0020-00 965-0018-00	A2-1 A2-1	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Display Display Display	(4M)	965-0131-00 965-0131-00 965-0120-00 965-0121-00 n Display PCB 5: 965-0122-00 n Display PCB 5:	-OR- A1.05	ROM 0 ROM 1	960-5007-00 960-5010-00 960-5010-00
Time Mach CPU CPU Voice 1 Voice 2 Sound		965-0021-00 965-0022-00 965-0024-00 965-0025-00 965-0023-00	A2-4 A2-4	B5 C5 6F 4F 7F	960-5006-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Rocky & B CPU Voice 0 Voice 1 Sound Display	ullwink (512K) (4M) (2M) (256K) (4M)	le & Friends 965-0138-00 965-0139-00 965-0140-00 965-0141-00 965-0142-00	A1.30	C5 U17 U21 U7 ROM 0	960-7001-02 960-5015-00 960-5010-00 960-5007-00 960-5015-00
Playboy 35 CPU CPU Voice 1 Voice 2 Sound	th Ann (256K) (256K) (512K) (512K) (256K)	965-0046-00 965-0047-00 965-0049-00 965-0050-00 965-0048-00	A2-4 A2-4	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Jurassic P CPU Voice 0 Voice 1 Sound Display	(512K) (4M) (2M) (256K) (4M)	965-0143-00 965-0144-00 965-0145-00 965-0146-00 965-0147-00	A5.13 A5.10	C5 U17 U21 U7 ROM 0	960-7001-02 960-5015-00 960-5010-00 960-5007-00 960-5015-00
ABC Mond CPU CPU Voice 1 Voice 2 Sound	ay Nigh (128K) (256K) (512K) (512K) (256K)	965-0031-00 965-0032-00 965-0034-00 965-0035-00 965-0033-00	A2-7 A2-7	B5 C5 6F 4F 7F	960-5006-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	CPU Voice 0 Voice 1 Sound Display	(512K) (4M) (2M) (256K) (4M)	965-0148-00 965-0149-00 965-0150-00 965-0151-00 965-0152-00	A1.12 A1.06	C5 U17 U21 U7 ROM 0	960-7001-02 960-5015-00 960-5010-00 960-5007-00 960-5015-00
Robocop CPU CPU Voice 1 Voice 2 Sound	(256K) (256K) (512K) (512K) (256K)	965-0036-00 965-0037-00 965-0039-00 965-0040-00 965-0038-00	A3-4 A3-4	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Tales from CPU Voice 0 Voice 1 Sound Display	(512K) (4M) (2M) (256K) (4M)	965-0157-00 965-0158-00 965-0159-00 965-0160-00 965-0161-00	A3.03 A3.01	C5 U17 U21 U7 ROM 0	960-7001-02 960-5015-00 960-5010-00 960-5007-00 960-5015-00
Phantom o CPU CPU Voice 1 Voice 2 Sound	f the O (128K) (256K) (512K) (512K) (512K) (256K)	pera 965-0026-00 965-0027-00 965-0029-00 965-0030-00 965-0028-00	A3-2 A3-2	B5 C5 6F 4F 7F	960-5006-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	The Who's CPU Voice 1 Voice 2 Voice 3 Voice 4 Sound	(512K) (4M) (4M) (4M) (4M) (4M) (512K) (4M)	965-0162-00 965-0165-00 965-0166-00 965-0167-00 965-0168-00 965-0164-00	A4.00	C5 U17 U21 U36 U37 U7	960-7001-02 960-5015-00 960-5015-00 960-5015-00 960-5015-00 960-7001-02 960-5015-00
CPU CPU Voice 1 Voice 2 Sound	(256K) (256K) (256K) (512K) (512K) (256K)	965-0041-00 965-0042-00 965-0044-00 965-0045-00 965-0043-00	A2-0 A2-0	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Display WWF Roya CPU Voice 1 Voice 2 Voice 3	(512K) (4M) (4M)	965-0169-00 965-0172-00 965-0173-00	A4.00 A1.06	C5 U17 U21 U36	960-5015-00 960-7001-02 960-5015-00 960-5015-00 960-7001-02 960-5015-00
The Simps CPU CPU Voice 1 Voice 2 Sound	(128K) (256K) (512K) (512K) (512K) (256K)	965-0051-00 965-0052-00 965-0054-00 965-0055-00 965-0053-00	A2-7 A2-7	B5 C5 6F 4F 7F	960-5006-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Guns N' Re	(4M) (512K) (4M) OSES (512K) (4M) (4M)	965-0174-00 965-0171-00 965-0170-00 965-0175-00 965-0178-00 965-0179-00	A1.02	U36 U7 ROM 0	960-7001-02 960-5015-00 960-7001-02 960-5015-00 960-5015-00
Checkpoin CPU CPU Voice 1 Voice 2 Sound	(128K) (256K) (1M) (1M) (256K) (512K)	965-0056-00 965-0134-00 965-0057-00 965-0058-00 965-0059-00 965-0060-00	A1-7 A1-7	B5 C5 F7 F5 F4	960-5006-00 960-5007-00 960-5009-00 960-5009-00 960-5007-00	Voice 2 Voice 3 Voice 4 Sound Display	(4M) (4M) (512K) (4M)	965-0180-00 965-0181-00 965-0177-00 965-0176-00	A3.00	U36 U37 U7 ROM 0	960-5015-00 960-5015-00 960-7001-02 960-5015-00
CPU CPU Voice 1 Voice 2		965-0060-00 linja Turtles 965-0061-00 965-0063-00 965-0064-00 965-0065-00	CP80 A1.04 A1.04	U8 B5 C5 F5/6 F4/5 F7	960-7001-02 960-5006-00 960-5009-00 960-5009-00 960-5007-00 960-7001-02	CPU Voice 1 Voice 2 Voice 3 Sound Display* Display*	(512K) (4M) (4M) (4M) (512K) (4M) (4M)	965-0182-00 965-0186-00 965-0187-00 965-0187-01 965-0183-00 965-0183-00 965-0184-00	A4.01 A4.01 A4.01	C5 U17 U21 U36 U7 ROM 0 ROM 3	960-7001-02 960-5015-00 960-5015-00 960-5015-00 960-7001-02 960-5015-00 960-5015-00
Sound Display Batman CPU CPU Voice 1 Voice 2	(128K) (256K) (2M)	965-0066-00 965-0067-00 965-0135-00 965-0068-00	A1.06 A1.06	B5 C5 U17	960-5006-00 960-5007-00	Mary Shell CPU Voice 1 Voice 2 Voice 3 Sound Display* Display*	ey's Fra (512K) (4M) (4M) (4M) (512K) (4M) (4M)	965-0188-00 965-0192-00 965-0193-00 965-0193-00 965-0191-00 965-0189-00 965-0190-00	* A1.03 A1.03 A1.03 A1.03	C5 U17 U21 U36 U7 ROM 0 ROM 3	960-7001-02 960-5015-00 960-5015-00 960-5015-00 960-7001-02 960-5015-00 960-5015-00
Sound Display Star Trek 2 CPU Voice 1 Voice 2	(256K) (1M)	965-0072-00 965-0073-00 965-0074-00	A1.06 A2.01	U21 U7 U8 C5 U17 U21	960-5009-00 960-5007-00 960-5009-00 960-7001-02 960-5010-00 960-5010-00	Baywatch CPU Voice 1 Voice 2 Sound	* (512K) (4M) (4M) (512K)		Board 520-50 A4.00	003-04) C5 U17 U21 U7	960-7001-02 960-5015-00 960-5015-00 960-7001-02 960-5015-00 960-5015-00
Sound Display Hook CPU Voice 1 Voice 2 Sound	(512K) (2M) (2M) (2M) (256K) (1M)	965-0075-00 965-0076-00 965-0078-00 965-0078-00 965-0079-00 965-0080-00	A1.09 A4.08	C5 U17 U21 U7	960-5007-00 960-5009-00 960-5010-00 960-5010-00 960-5010-00 960-5007-00 960-5009-00	Display* Display* Batman For CPU Voice 1 Voice 2 Sound	(512K) (4M) (4M) (512K)	(CPU 965-0202-00 965-0203-00 965-0204-00 965-0205-00	A4.00 A4.00 Board 520-50 A3.02	C5 U17 U21 U7	960-7001-02 960-5015-00 960-5015-00 960-7001-02
Display	(1M)	965-0081-00	A4.01	U8	960-5009-00	Display* Display*	(4M) (4M)	965-0206-00 965-0207-00	A3.00 A3.00	ROM 0 ROM 3	960-5015-00 960-5015-00

* Note: Display EPROMS (4M) for Maverick thru Batman Forever require an access time of 120 Nsec or faster.



APPENDIX B

Semi-Conductors / Integrated Circuits (I.C.) / Relays Cross-Reference Table

Table Nº	Туре	Source Number	STERN® PINBALL	N T E®	E C G®	Radio Shack®	R C A®
,	RECTIFICATION	N, BLOCKING, DA	MPENING DIODE	9 AND/OR LI	GHT EMITTIN	IG DIODES (I	LEDs)
	Diode	1N4001	112-5001-00	NTE552	ECG552		SK9000
	Diode	1N4004	112-5003-00	NTE116	ECG116	276-1103	SK3312
	Diode	1N5401	112-0056-00	NTE5801	ECG5801	276-1143	SK9004
_	Diode	1N5404	112-5004-00	NTE5804	ECG5804	276-1144	SK9007
1	Diode	T6A10L	112-5006-01	NTE5812	ECG5812		
•	Diode	FR302	112-5009-00	NTE588	ECG588		SK5014
	Diode, Signal	1N914	112-5014-00				
	LED	MT5000UR or TLRH180P	165-5052-00 (old SPI Part №:			276-066B	
		(T1-3/4 GaAIAs)	165-5100-00)				
	ZENER DIODES	3					
	Diode	1N4742A 12v	112-0061-00	NTE142A	ECG142A	276-563	SK12V
	Diode	1N4760B 68v	112-0062-00B	NTE5092A	ECG5092A		SK68V
	Diode	1N4764A 100v	112-0049-00A	NTE5096A	ECG5096A		SK100V
	Diode	1N5228 3.9v	112-0053-00	NTE5007A	ECG5007A		SK3A9
2	Diode	1N5234B 6.2v	112-0047-00B	NTE5013A	ECG5013A	276-561	SK6A2
	Diode	1N5379 110v	112-0072-00	NTE5157	ECG5157	- — - — -	SK110X
	Diode	1N6267A 6.8v	112-5011-00	NTE4902	ECG4902	- — - — -	
	Diode	1N4752A 33v	112-5010-00A	NTE147A	ECG147A		SK33V
	Diode	1N4736 6.8v 1w	112-5007-00	NTE5071A	ECG5071A		
	TRANSISTORS	- TYPE FET, NPN	, PNP AND/OR 9	CR			
	FET Trans.	STP20N10L	110-0106-00	NTE2987	ECG2987		
	FET Trans.	STP19N06L	110-0088-00	NTE2985	ECG2985		
	FET Trans.	VN02N	110-0089-00				
	NPN Trans.	2N4401	110-0073-00	NTE85	ECG85	276-2009	SK3124A
	NPN Trans.	2N6427	110-0070-00	NTE48	ECG48		SK4906
	NPN Trans.	MJE340	110-0071-00	NTE157	ECG157		SK3747
	NPN Trans.	MPSA42	110-0082-00	NTE287	ECG287		SK3232
	NPN Trans.	2N3904	110-0069-00	NTE123AP	ECG123AP	276-2009	
3	NPN Trans.	TIP122	110-0067-00	NTE261	ECG261	276-2068	SK3896
	NPN Trans.	MJE15030	110-0101-00	NTE375	ECG375		SK9118
	PNP Trans.	2N5401	110-0078-00	NTE288	ECG288		SK3434
	PNP Trans.	MJE15031	110-0103-00	NTE292	ECG292		SK3441
	PNP Trans.	MJE350	110-0072-00	NTE374	ECG374		SK9042
	PNP Trans.	MPSA92	110-0100-00	NTE288	ECG278		SK3434
	PNP Trans.	TIP42	110-0068-00	NTE332	ECG332		SK9236
	PNP Trans.	TIP32C	110-0081-00	NTE292	ECG292		SK3441
	PNP Trans.	TIP36C	110-0077-00	NTE393	ECG393		SK3961
	SCR Trans.	2N5060	110-0074-00	NTE5400	ECG5400	276-1067	SK3950
	SCR Trans. BRIDGE RECTI	SCR2800B	110-0083-00	NTE5461-8	•	•	<u> </u>
	BRIDGE RECII				Comr	nents:	
4	BR (Present)	DB3501 or CM3501	112-5000-00	For White Sta	rl/O Bds., BR	a = 35 Amp @	100v P.I.V.
	RELAYS					nents:	
	Relay	FRL-264 D024/02CK	190-5002-00	Relay = 24v	DC 10 Amp	& White Star DPDT	I/O Boards,
5	Relay	FRL-264 D006/04CV	190-5001-00	For CPU Bo Relay = 6v [ards, DC 5 Amp 4 F	Pole DT	



APPENDIX C



Production Start Date, Manual Part №, ROM Size & Positions and Jumper W6 Installed Note‡ (White Star Board System & S.A.M. System Only*)

_	ame Name White Star	Production Start Date	CPU/So	ound Board	Game U2	210 1MB	Mote)
	l. System™	and Manual Part Nr.	U17	ound Boa U21	U36	U37	Jump Instal (‡ see !)
* N	through betweei or on-lir	nplete Apper Batman Fo n Apollo 13 ne at our web ailable on CE	<mark>rever</mark> , so through osite ww	ee any S <mark>Ripley's</mark> w.sternp	Service C Believ Sinball.co	Game Ma e It or N om/parts:	anual <mark>ot!</mark> htm;
	Pinball	ailable on CI <mark>Party, T3</mark> ®	and The	Lord of	f the Rin	gs TM).	
29	Apollo 13 (A13)	NOV 95 780-5044-00	4MB	4MB	4MB	Not Used	n/a
30	Golden Eye	FEB 96 780-5042-00	4MB	4MB	Not Used	Not Used	n/a
31	Twister	APR 96 780-5041-00	4MB	4MB	Not Used	Not Used	n/a
32	ID4: Independence Day	JUL 96 780-5045-00	4MB	4MB	Not Used	Not Used	n/a
33	Space Jam	OCT 96 780-5043-00	4MB	4MB	4MB	Not Used	n/a
34	The Star Wars Trilogy - Sp. Ed.	FEB 97 780-5056-00	4MB	4MB	Not Used	Not Used	n/a
35	The Lost World: Jurassic Park	JUN 97 780-5053-00	4MB	4MB	Not Used	Not Used	n/a
36	The X-Files	AUG 97 780-5046-00	4MB	4MB	Not Used	Not Used	n/a
37	Starship Troopers	NOV 97 780-5059-00	4MB	4MB	4MB	Not Used	n/a
38	Viper Night Drivin'	FEB 98 780-5035-00	4MB	4MB	4MB	4MB	n/a
39	Lost In Space	JUN 98 780-5060-00	4MB	4MB	4MB	4MB	n/a
40	Godzilla	SEP 98 780-5040-00	4MB	4MB	4MB	4MB	n/a
41	South Park	JAN 99 780-5071-00	8MB	8MB	8MB	8MB	W6
42 a	Harley- Davidson®	AUG 99 780-5067-01	8MB	8MB	8MB	8MB	W6
42 b	Harley-David- son®2nd Ed.	SEP 02 780-5067-10	8MB	8MB	8MB	8MB	W6
42 c	Harley-David- son® 3rd Ed.	OCT 04 780-5087-00	8MB	8MB	8MB	8MB	W6
43 a	Striker Xtreme	MAR 00 780-5068-01	8MB	8MB	8MB	8MB	W6
43 b	NFL	OCT 00 780-50 73 -00	8MB	8MB	8MB	8MB	W6
44	Sharkey's Shootout	JUL/OCT 00 780-5072-01	8MB	8MB	8MB	Not Used	W6
45	High Roller Casino	JAN 01 780-5065-00	8MB	8MB	8MB	8MB	W6
46	Austin Powers™	MAY 01 780-5074-00	8MB	8MB	8MB	8MB	W6
47	MONOPOLY®	SEP 01 780-5075-00	8MB	8MB	8MB	Not Used	W6
48	Playboy	FEB 02 780-5076-00	8MB	8MB	8MB	8MB	W6
49	RollerCoaster Tycoon™	AUG 02 780-5078-00	8MB	8MB	8MB	Not Used	W6
50	The Simpsons™ Pinball Party	JAN 03 780-5077-00	8MB	8MB	8MB	8MB	W6
51	T3®: Rise of the Machines™	MAY 03 780-5079-00	8MB	8MB	8MB	8MB	W6
52	The Lord of the Rings™	NOV 03 780-5080-00	8MB	8MB	8MB	8MB	
53	Ripley's Believe It or Not!®	APR 04 780-5081-00	8MB	8MB	8MB	8MB	

Game Name White Star		Production Start Date and Manual	CPU/Sound Board Sound U7 512K CPU/Sound Board Game U210 1MB CPU/Sound Board Voice ROMS:				
	Board System™	Part Nr.	U17	U21	U36	U37	
54	Elvis®	AUG 04 780-5084-00	8MB	8MB	8MB	8MB	
55	The Sopranos ^{sм}	FEB 05 780-5085-00	8MB	8MB	8MB	8MB	
56	NASCAR®	JUL 05 780-5086-00	8MB	8MB	8MB	8MB	
57	Grand Prix	SEP 05 780-5091-00	8MB	8MB	8MB	8MB	

See Apdx. A for more detailed information on Pinball Game Firmware (ROM Name, Size, Part Numbers, USA Version & Checksum and Board Locations).

Game Name		Production Start Date	S.A.M. System CPU/Sound Board Boot EPROM U9						
	S.A.M. System	and Manual Part Nr.	965-B	965-BOOT-SAM (Programmed)					
58	World Poker Tour TM (WPT)	JUN 06 780-5088-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			
59	The Simpsons™ Kooky Carnival	APR 06 780-5090-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			
60	©Disney's Pirates of the Caribbean	AUG 06 780-5092-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			
61	Famil Guy™	DEC 06 780-5093-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			
62	Spider-Man TM	MAY 07 780-5094-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			

Games 58 – current, S.A.M. System : CPU/Sound & I/O Power Driver PCBs differ than White Star ($previous\ Games\ 29-57$); Disp. Controller Not Required.

See **Apdx.** A for more detailed information on **Pinball Game Firmware** (ROM Name, Size, Part Numbers, USA Version & Checksum and Board Locations).



[‡] Additional Information for **Installed** Jumper (above games 41-51):

[•] Installed **W6** so 8MB ROMS can be utilized. See the **CPU/Sound Board Schematic** (Sheet 2 of 3, Address Location 3E) in the games' Service Game Manual. Games 52 - 57 CPU/Sound Board differ than <51 (See Appendix D).



APPENDIX D Board Type (White Star Board System* Only) Table



Game Name	Flipper	I/O Power Driver	CPU/Sound Stereo	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application
	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
Apollo 13	Miscellaneous	Light Board	ds 520-5130-01, Display & Light B	-04 & -05 Magne d. 520-5130-06 N	et Interface.	Relay Board 520-5010-00	Olligic Of TO	Olligic Of TO	OVER OF RICKER
	PC Boards: 520-5080-00	Board 520-5	130-02 Switch M	lembrane Board	<u>520-5130-03</u>		520-5124-00	520-5125-00	5-Ball Trough
Golden Eye	2-Flipper Miscellaneous	520-5137-00	520-5136-00 Boards	520-5138-00 Mag Processo	520-5052-00 128 X 32 Dots or X2 Driver Bd.	520-5055-01 Relay Board	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
GAMES HER	PC Boards:	520-5128-0	5 through -08	520-5 ⁻	143-00	520-5010-00	TM		
Game	I/O Power	CPU/Sound	Disp. Power	Dot Matrix	Display	ОРТО	ОРТО	ОРТО	Misc OPTO
Name	Driver 520-5137-01	Mono 520-5136-10	Supply 520-5138-00	Display 520-5052-00 128 X 32 Dots	Confroller 520-5055-01	Transmitter 520-5124-00 Single OPTO	Receiver 520-5125-00	Application 5-Ball Trough	& Арр.
Twister	Miscellaneous	Light I	Boards	Mag. Drv. Bd.	Relay Board 520-5010-00	Single OPTO	Single OPTO	over Up-Kicker	
	PC Boards: 520-5137-01	520-5145-0° 520-5136-10	through -07 520-5138-00	520-5143-00 520-5052-00 128 X 32 Dots	520-5010-00 520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough	
Independence Day (ID4)	Miscellaneous	Light E	Boards	Servo Mtr. Bd.	320-3033-01	520-5082-00	520-5083-00	over Up-Kicker Alien Head	
	PC Boards: 520-5137-01	520-5149-0° 520-5136-10	through -10 520-5138-00	520-5152-00 520-5052-00 128 X 32 Dots	520-5055-01	Long Hop орто 520-5124-00 Single OPTO	Long Hop орто 520-5125-00	Enter 5-Ball Trough	
Space Jam	Miscellaneous PC Boards:	2X 7-Segment	Display Board	128 X 32 Dots	320-3033-01	Single OPTO	Single OPTO	over Up-Kicker	
The Star	520-5137-01	520-5 520-5136-10	153-00 520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough	
Wars Trilolgy - Special Ed.	Miscellaneous	Relay Board	020 0.00 00	128 X 32 Dots	020 0000 01	Single OPTO	Single OPTO	over Up-Kicker	
	PC Boards: 520-5137-01	520-5010-00 520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single ODTO	520-5125-00 Single OPTO	4-Ball Trough	520-5162-00
The Lost World: J.P.	MiscellaneousF C Boards:	DC Relay Bd.	Shaker Mtr. Bd.	128 X 32 DOIS		Single OPTO	Single OPTO	over Up-Kicker	2-Pos. Motor Sensor on Snagger Motor
	520-5137-01	520-5066-00 520-5136-10	520-5065-00 520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	520-5155-00 3-Pos. Motor
The X-Files	Miscellaneous PC Boards:			120 X 32 D0l5		520-5082-00	520-5083-00	File Cabinet	Sensor on File Cab.
	520-5137-01	520-5136-15	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-02	Long Hop opto 520-5124-00 Single OPTO	Long Hop орто 520-5125-00 Single OPTO	Enter 4-Ball Trough	Motor
Starship Troopers	Miscellaneous PC Boards:	4X 7-Segment	Display Board	128 X 32 Dots	320-3033-02	520-5082-00	520-5083-01	over Up-Kicker L/R Orbit	
	PC Boards: 520-5137-01	<u>520-5</u> 520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	Long Hop орто 520-5124-00 Single OPTO	Long Hop OPTO 520-5125-00 Single OPTO	Lane Enter 4-Ball Trough	
Viper Night Drivin'	Miscellaneous	Relay Board	320-3136-00	128 X 32 Dots	320-3033-03	520-5082-00	520-5083-01	over Up-Kicker Jump Ramp	
	PC Boards: 520-5137-01	520-5010-00 520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	Long Hop орто 515-0173-00	Long Hop орто 515-0174-00	4-Ball Trough	
Lost In Space	Miscellaneous PC Boards:	Relay Board	320 3100 00	128 X 32 Dots	320 3033 00	Dual OPTO	Dual OPTO	over Up-Kicker	
	520-5137-01	520-5010-00 520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00	4-Ball Trough	
Godzilla	Miscellaneous	Shaker Mtr. Bd.		128 X 32 DOIS		Dual OPTO	Dual OPTO	over Up-Kicker	
	PC Boards: 520-5137-01	520-5065-00 520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	5-Ball Trough	
South Park	Miscellaneous PC Boards:			120 X 32 D0l5		520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Kenny Under Trough Enter	
Harley- Davidson®	520-5137-01	520-5136-16 *520-5300-00*	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
1st-3rd* Editions	Miscellaneous PC Boards:	Relay Board 520-5010-00	Shaker Mtr. Bd. 520-5065-00	Diode Board 520-5146-00		520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Motorcycle Enter	
Striker Xtreme	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5155-00 3-Pos. Motor
Xtreme (NFL)	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Relay Board 520-5010-00	Diode Board 520-5146-00	for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Goalie Under- Trough Enter	Sensor on Goalie Motor
Sharkev's	520-5137-64	520-5136-64	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5194-00 4-Pos. Motor
Sharkey's Shootout	MiscellaneousF C Boards:	Relay Board 520-5010-00	Sol. Exp. Bd. 520-5192-00					·	Sensor on ?-Ball Motor
	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5194-00 4-Pos. Motor
High Roller Casino						520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Ball Lock under Roulette	Sensor on Roulette
	Miscellaneous PC Boards:	Dot Display (5X 520-5	(7) in Slot Mach. 197-00		for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5196-00 3-Pos. OPTO	520-5195-00 3-Pos. OPTO	Up/Dn Ramp in Slot Mach.	Wheel Motor
Austin	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5212-00
Powers TM	MiscellaneousF C Boards:	Relay Bd. (X3) 520-5010-00			for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Time Machine Ramp	Pulse-Stretcher OPTO on Spini-Me
MONORCHI	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
MONOPOLY®	MiscellaneousF C Boards:	DC Relay Bd. 520-5066-00		lay (3 by 5X7) (Electric C° Sign)	for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5218-00 4-Pos. OPTO	520-5210-00 4-Pos. OPTO	Bank Door	
	J	020-3000-00	<u> </u>	(Electric C Sign)	320-3192-00		ble continu		vt nago







Board Type (White Star Board System* & S.A.M. System** Only) Table

Game Name	I/O Power Driver	CPU/Sound (old & new)	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application	Misc OPTO & App.
	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
Playboy	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Relay Bd. 520-5010-00		for UK ONLY> Sol- enoid Expander Bd. 520-5192-00				
RollerCoaster	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5222-00 1-Position
Tycoon TM	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Mini-Dot Disp 520-5221-00	lay (3 by 5X7) (Ramp Enter Sign)	for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5082-00 Long Hop о рто	520-5083-01 Long Hop орто	Behind 1-Bank Drop Target	Switch Detect on Wheel Spin
The Simpsons™	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
Pinball Party	Miscellaneous PC Boards:	LED Bd. 520-5219-00	Color Dot Disp 520-5225	olay (4 by 5X7) i-00 (TV Set)	for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
Terminator®	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
Rise of the Machines™	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	515-7307-00 Single OPTO	515-7308-00 Single OPTO	TXCannon Trough	
The Lord of the	520-5137-01	New 520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6746-00 (White Trans.)
Rings TM	Miscellaneous PC Boards:	19-LED PCB 520-5242-00		itter / Receiver 3 520-5239-00	for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	515-7307-00 Single OPTO	515-7308-00 Single OPTO	Orthanc Tower Trough	`500-6747-00' (Black Rec.)
Ripley's Believe It	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trnscvr
or Not!®	Miscellaneous PC Boards:	520-5236-00 X3 Dot Display	OPTO Transm Amplifier PCE	nitter / Receiver 3 520-5239-01	for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	520-5234-00 3-Pos. OPTO	520-5234-00 3-Pos. OPTO	Vari-Target	520-5235-03 X3 Aux. Drvr
Elvis®	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
LIVIS®	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
The	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
Sopranos SM	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
NASCAR®	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trans.
and [NDSE]	Miscellaneous PC Boards:	520-5235-03 X3 Aux. Drvr	OPTO Transm Amplifier PCE	itter / Receiver 3 520-5239-01	for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				(Qty. 16) Switch Detect.
Grand Prix	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trans.
Gland I IIX	Miscellaneous PC Boards:	520-5235-03 X3 Aux. Drvr		hitter / Receiver 3 520-5239-01	for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				(Qty. 16) Switch Detect.
		7777							
Game Name	I/O Power Driver**	CPU / Sound**	Disp. Power Supply	Dot Matrix Display	Dual OPTO Transmitter	Dual OPTO Receiver	Dual OPTO Transceiver	OPTO Tra Miscell	ansceiver aneous
World Poker Tour™	520-5249-00 Backbox	520-5246-00 Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 4 Switch Pairs	520-5251-00 Jail Bars Up A	'U' 1/per PCB ce/Hole Mech
(WPT)	Miscellaneous PCBs:	520-5254-00 50V Step-Up Drv	520-5250-14 14LED 5X7 Disp.	520-5239-01 OPTO Amplifier	520-5247-00 Ace/Hole Mech	520-5248-00 Ace/Hole Mech	(Qty. 8)	520-5252-04 Drop Targets	'U' 4/per PCB 4- & 8- Banks
The Simpsons™	520-5249-00 Back Door	520-5246-00 Back Door	520-5138-00 Cabinet Rear	520-5052-00 128 X 32 Dots			520-5253-00-ASY Coin Drop		
Kooky Carnival	Miscellaneous PCBs:	515-5742-00 Shaker PCB	Relay (incl. V	700-00 /iring + Conn.)	545 0470 00	545 0474 00	(Qty. 11)		
©Disney's Pirates	520-5249-00 Backbox Miscellaneous	520-5246-00 Backbox 520-5239-01	520-5138-00 Backbox	520-5052-00 128 X 32 Dots 024-03	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 5 Switch Pairs		
of the Caribbean	PCBs:	OPTO Amp. (X3)		/iring + Conn.)			(Qty. 10)		
Family	520-5249-00 Backbox	520-5246-00 Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 3 Switch Pairs (Qtv. 6)	520-5252-01 Drop Targ	'U' 1/per PCB get 1-Bank
Family Guy™	Miscellaneous PCBs:		520-5261-00 Stepper Motor	511-5042-01 Trgt. Sensor (X2)		<u> </u>	500-6775-01 1 Switch Pair (Qty. 2)	520-5252-04 Drop Targ	'U' 4/per PCB get 4-Bank
Spider-	520-5249-00 Backbox	520-5246-00 Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 3 Switch Pairs		
Spider- Man™	Miscellaneous PCBs:	520-5239-01		21122300			(Qty. 6)		
-	1003.	ALIA UIIM (VE)							



APPENDIX D

Board Type Table

Game Name	Flipper	Sound	Power Supply	Display X-Digit
Laser War	Laser War 2-Flipper Board Not Required			Master: 520-5004-00 plus: 520-5005-00 (Qty. 2): 7 Digit Alpha/Numeric 520-5006-00 (Qty. 2): 7 Digit Numeric 520-5007-00 (Qty. 1): 4 Digit Numeric
Secret Service Torpedo Alley	3-Flipper Board Not Required			F20 F014 04
Time Machine	2-Flipper Board Not Required	500 5000 00	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Playboy 35th Anniversary *	520-5033-00	520-5002-02		
ABC Monday Night Football * Robocop Phantom of the Opera Back to the Future	2-Flipper (*only for 100 games of Playboy 35th Anniv. &			520-5030-00 16 Digit Alpha/Numeric Combined
The Simpsons	ABC Mon. Night Football)	520-5002 -03		

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Apllication
 Checkpoint Teenage Mutant Ninja Turtles 		520-5002-03	520-5047-00	520-5042-00				
BatmanStar Trek25th Anniv.Hook	520-5033-00 2-Flipper	520-5050-01	320-3047-00	128 X 16				
 Lethal Weapon 3 								
Star WarsRocky & Bull- winkle & Friends		520-5050-02	520-5047-01		520-5055-00			
Jurassic Park	520-5076-00 3-Flipper							
 Last Action Hero 	520-5070-00 2-Flipper	520-5050-03		520-5052-00 128 X 32				
 Tales from the Crypt 	520-5076-00	320-3030-03	520-5047-02	120 % 02				
The Who's Tommy	3-Flipper		020 00 02		520-5055-01			
 WWF Royal Rumble 	520-5070 / 5080 -00 4-Flipper (2X2)	520-5077-00			320-3033-01			
 Guns N' Roses 	520-5076-00							
Maverick	3-Flipper	520-5050-03				520-5102-00 Single OPTO	520-5103-00 Single OPTO	Paddle Boat Wheel Enter
 Mary Shelley's Frankenstein 	520-5076-00 3-Flipper	520-5077-00	520-5047-03	520-5075-00	520-5092-01			
Baywatch	520-5070 / 5080 -00 4-Flipper (2X2)	520-5126-02	J20-J047-03	192 X 64	320-3092 - 01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
Batman Forever	520-5076-00 3-Flipper	02U-0120-U2				520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker

Miscellaneous Boards (Lamp Boards & Relay Boards) not listed above can be found in each individual game manual.





Flipper Coil (White Star Board System* & S.A.M. System** Only) Table

THE STATE OF THE S

Typical Coil Diode 1N4004 unless noted otherwise (Diode Top = above lugs next to windings; Diode Below (Bottom) = under lugs opposite of windings).

SAM

	TANDARI Res (Ω)		PICAL APPLICATIONS) rt Number and Comments	LARG GaTurn			SPECIAL APPLICATIONS) rt Number and Comments
20-400	1.0 Ω	090-5021- <i>use</i> :		21-900	call Ω	090-5020- <i>use</i> :	
22-500	1.7 Ω	090-5017- <i>use</i> :		21-300	Octil SS	000 0020 000.	-10 Diode Top <brown><red></red></brown>
22-600	2.2 Ω		-0B Diode Below // -0T Diode Top	22-750 /	2.6 Ω 92.0 Ω	090-5011- <i>use</i> :	-00 DUAL WND COIL // 3-Lugs Diode x2
23-700	3.1 Ω		-0B Diode Below // -0T Diode Top	30-2600	92.0 Ω		
23-750	3.4 Ω	090-5019- <i>use</i> :		22-900	3.45 Ω	090-5020-use:	
23-800	3.6 Ω		-0B Diode Below // -0T Diode Top //		T		-20-ND No Diode
			-NL No Lugs 11" Leads // -ND No Diode	22-1080	4.2 Ω	090-5032- <i>use</i> :	-0B D. Below // -0T D. Top <yel-grn></yel-grn>
23-840	4.0 Ω	090-5005- <i>use</i> :		00 000 /	04.0	000 5000	
23.5-765	3.6 Ω	090-5037- <i>use</i> :		23-620 / 30-2600	2.4 Ω 75.0 Ω	090-5006- <i>use</i> :	-00 DUAL WND COIL // 3-Lugs Diode X2
24-900	5.0 Ω		-02 Diode Top // -10 No Lugs 14" Leads			000 5010	-00 DUAL WOUND COIL // Diode Top
24-940	5.5 Ω	090-5036- <i>use</i> :	-0B Diode Below // -0T Diode Top use 090-5051-01 No Lugs 11" Leads	23-700 / 30-2600	3.0 Ω 83.5 Ω		
25-1240	9.3 Ω	090-5034- <i>use</i> :	-00 Diode Below	23-800 /	2.4 Ω 90.5 Ω	090-5012- <i>use</i> :	-00 DUAL WOUND COIL // Diode Top
26-1200	10.3 Ω		-0B Diode Below // -0T Diode Top //	30-2600	90.5 \(\Omega\)2		
			-NL No Lugs 11" Leads // -ND No Diode	23-900	4.05 Ω	090-5020- <i>use</i> :	-30 Diode Top <green></green>
27-1300	14.2 Ω	090-5003- <i>use</i> :		23-1100	5.1 Ω	090-5030- <i>use</i> :	-0T Diode Top <orange></orange>
27-1400	14.7 Ω	090-5015- <i>use</i> :	-00 Diode Below	00.4000	74.0	000 5000	
27-1400			Special App.: No Diode / Lugs + Conn.	23-1200		090-5008- <i>use</i> :	
27-1500			-0B Diode Below // -0T Diode Top	23-1500	4.4 Ω		-00 Diode Top <blue> -00 Diode Top <blue></blue></blue>
29-2000		090-5016- <i>use</i> :		24-1570	9.5 Ω	090-5025- <i>use</i> :	
LARGE,			(MAGNET APPLICATIONS)	25-1400	$call \Omega$		-0T Diode Top <red> -0T Diode Top <white></white></red>
20.5-480	2.9 Ω		-02 No Lugs <i>or</i> Core; 14" Leads // Large	25-1600	V 0.11		
22-650	4.3 Ω	090-5042- <i>use</i> :	-00 No Lugs <i>or</i> Core; 6" Leads // Large - 01 No Lugs <i>or</i> Core; 12" Leads // Large	25-1800		090-5041- <i>use</i> : S (RESET / T	TRIP APPLICATIONS
24-780	8.0 Ω	090-5061- <i>use</i> :	-00 No Lugs or Core; 6" Lds. // Medium	27-950		090-5046- <i>use</i> :	
29-1000	15.2 Ω	090-5059- <i>use</i> :	-00 Lugs + Diode + Magnet Core // Mini	28-1050	11.5 Ω	090-5046- <i>use</i> :	-00 Diode Top
31-1500	52.0 Ω		Straight Lugs + Diode + Mag Core // Mini	27-880	call Ω	500-6976-01	No Lugs <i>or</i> Diode + 6" Leads & Conn.
			90° Lugs + Diode + Magnet Core // Mini	31-590	call Ω	090-5010-use:	
			.03 depending on meter calibration.	32-1250	35.0 Ω		includes Flap & Screw <yellow></yellow>
EXISTS, ensu	re it is the co	rrect sleeve for th	ome with Coil Sleeves. IF A SLEEVE are application usage. For the correct Coil g the coil exists on and order separately.	32-1800	50.2 Ω	090-5031- <i>use</i> : (515-6110-00)	-0B Diode Below // -0T Diode Top use 515-# to include mounting & armature brackets
Sieeve, reier to	o ule Gaille /	noociiibiy DidWili	y ine con exists on and order separately.	33-1590	59.0 Ω	515-6916-00 :	includes brackets <white></white>

Flipper Coil (White Star Board System* Only) Table

GAME NAME	Nº of	FLIPP SPINº/GAUGE	ERS -TURNS / Color		E.O.S. Switch E-TURNS / Color	
	Flippers	LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT	
* Note: For complete Appendix Information Ripley's Believe It or Not!; or	ation for Gar order CD-R	nes Laser War through Bat	man Forever, see any Servers™ Pinball Party, Termin	rice Game Manual between A lator® 3 and The Lord of th	Apollo 13 through e Rings™).	
Apollo 13	2	090-5032-0T 22-1080 -YEL-GRN -	SAME	Not Used	Not Used	
Golden Eye	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
Twister	2	090-5020-20T 22-900 -YELLOW-	090-5032-0T 22-1080 -YEL-GRN-	Not Used	Not Used	
ID4: Independence Day	3	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	090-5020-30 23-900 -GREEN-	
Space Jam †	2	090-5032-0T 22-1080 -YEL-GRN-	090-5020-20T 22-900 -YELLOW-	Not Used	Not Used	
The Star Wars Trilogy - Special Edition †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
The Lost World: Jurassic Park †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
The X-Files †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
Starship Troopers †	3	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	090-5032-0T 22-1080 -YEL-GRN-	
Viper Night Drivin' †	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used	
Lost In Space †	2	090-5030-0T 23-1100 -ORANGE-	090-5032-0T 22-1080 -YEL-GRN-	Not Used	Not Used	
Godzilla †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
South Park †	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used	

Coil Part Numbers ending with a "T" signifies the Diode is on the top of the lug (on the coil-winding side);
 Coil Part Numbers ending with a "B" signifies the Diode is on the bottom of the lugs.

Table continued on the next page.







Flipper Coil (White Star Board System* & S.A.M. System** Only) Table



	NIO of	FLIPPERS w/E	.O.S. Switch	FLIPPERS no	E.O.S. Switch
GAME NAME	Nº of Flippers	SPI Nº / GAUGE	-TURNS / Color	SPI № / GAUGE	-TURNS / Color
	i lippers	LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT
Harley-Davidson® † and 1st through 3rd Editions	2	090-5032-0T 22-1080 -YEL-GRN-	090-5030-0T 23-1100 -ORANGE-	Not Used	Not Used
Striker Xtreme (NFL) †	3	090-5032-0T 22-1080 -YEL-GRN-	090-5030-0T 23-1100 -ORANGE-	090-5030-0T 23-1100 -ORANGE-	Not Used
Sharkey's Shootout †	3	090-5030-0T 23-1100 -ORANGE-	SAME	090-5030-0T 23-1100 -ORANGE-	Not Used
High Roller Casino †	2	090-5020-20T 22-900 -YELLOW-	090-5032-0T 22-1080 -YEL-GRN-	Not Used	Not Used
Austin Powers TM †	2	090-5020-30 23-900 -GREEN-	090-5030-0T 23-1100 -ORANGE-	Not Used	Not Used
MONOPOLY®†	3	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	090-5062-0T 23-1500 -BLUE-
Playboy †	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used
RollerCoaster Tycoon TM †	4	090-5032-0T 22-1080 -YEL-GRN-	SAME	090-5067-0T 25-1400 -RED-	090-5068-0T 25-1600 -WHITE-
The Olympia and TM	6**	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	090-5030-0T 23-1100 -ORANGE-
The Simpsons™ Pinball Party †	(5 with Flipper	** The Homer Head As	sembly is affixed to an	Flippers (Mini-Bats) o	on 2nd Level Playfield:
T IIIDAII T AITY	Bats)	Upr. Rt. Style Flipper (no E.O.S. Switch):	** 090-5020-20T 22-900 -YELLOW-	090-5041-00T 25-1800 -BLU-GRN-	090-5025-00 24-1570 -BLUE-
Terminator® 3: Rise of the Machines™ †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
The Lord of the Rings™ †	2	090-5020-20T 22-900 -YELLOW-	SAME	Not Used	Not Used
Ripley's Believe It or Not!® †	3	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	090-5067-00T 25-1400 -RED-
Elvis®†	4	090-5020-20T 22-900 -YELLOW-	SAME	090-5020-30 23-900 -GREEN-	SAME
The Sopranos ^{sм} †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
NASCAR® and [NDSE] †	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used
Grand Prix † † Coil Part Numbers ending with a "T" sign	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used

** S.A.M. System Games **DO NOT REQUIRE DIODES**. If you use a coil from your stock which has a diode, remove it **ONLY FOR** S.A.M. System Games.

World Poker Tour™ (WPT)**	4	090-5032-ND 22-1080 [NO DIODE]	SAME	090-5030-ND 23-1100 [NO DIODE]	SAME
©Disney's Pirates of the Caribbean**	2	090-5030-ND 23-1100 [NO DIODE]	SAME	Not Used	Not Used
Family	3 Norm.	090-5030-ND 23-1100 [NO DIODE]	SAME	090-5062-ND 23-1500 [NO DIODE]	Not Used
Guy™ **	2 Mini	090-5046-01-ND 27-950 [NO DIODE]	SAME		
Spider- Man TM **	3	090-5032-ND 22-1080 [NO DIODE]	SAME	Not Used	090-5032-ND 22-1080 [NO DIODE]



Flipper Coil Table ‡ ††

		Filipper Co	oil Table ‡ ††		
GAME NAME	Nº of	FLIPPERS W/E			E.O.S. Switch
GAME NAME	Flippers	9PI № / GAUGE LOWER LEFT	LOWER RIGHT	UPPER LEFT	-TURN9 / Color UPPER RIGHT
Laser War ‡	2	090-5011-00 22-750 / 30-2600	SAME	Not Used	Not Used
Secret Service ‡	3	090-5006-00 23-620 / 30-2600	SAME	Not Used	090-5006-00 23-620 / 30-2600
Torpedo Alley ‡	3	090-5011-00 22-750 / 30-2600	090-5013-00 23-700 / 30-2600	Not Used	090-5012-00 23-800 / 30-2600
Time Machine ‡	2	090-5011-00 22-750 / 30-2600	SAME	Not Used	Not Used
‡ These coils are dual-wound.					
Playboy 35th Anniversary ††	2	090-5020-02 22-900 -YEL-YEL-	SAME	Not Used	Not Used
ABC Monday Night Football ††	2	090-5020-02 22-900 -YEL-YEL-	SAME	Not Used	Not Used
†† A very small % of these games used	090-5020-20	coil which used a proto-type Solid	d State Flipper System. The two	types of coils both are 22-900 co	ls; the only difference is the
addition of the 1N5404 Diode on the (2 coils which	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used
Phantom of the Opera	2	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used
Back to the Future	2	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used
The Simpsons	2	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used
Checkpoint	2	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used
Teenage Mutant Ninja Turtles	2	090-5020-30 23-900 -GRN-GRN-	SAME	Not Used	Not Used
Batman	2	090-5020-30 23-900 -GRN-GRN -	SAME	Not Used	Not Used
Star Trek 25th Anniversary	2	090-5020-30 23-900 -GRN-GRN-	SAME	Not Used	Not Used
Hook	2	090-5030-00 23-1100 -ORG-ORG-	090-5020-30 23-900 -GRN-GRN -	Not Used	Not Used
Lethal Weapon 3	2	090-5030-00 23-1100 -ORG-ORG-	SAME	Not Used	Not Used
Star Wars	2	090-5032-00 22-1080 -YEL-GRN -	SAME	Not Used	Not Used
Rocky & Bullwinkle & Friends	2	090-5020-30 23-900 -GRN-GRN -	SAME	Not Used	Not Used
Jurassic Park	3	090-5020-30 23-900 -GRN-GRN -	SAME	Not Used	090-5030-00 23-1100 -ORG-ORG-

Table continued on the next page.



APPENDIX E

Flipper Coil Table †

	Nº of	FLIPPERS w/E		FLIPPERS no	
GAME NAME	Flippers	SPI Nº / GAUGE	•	SPI № / GAUGE	
	_	090-5020-30	LOWER RIGHT	UPPER LEFT	UPPER RIGHT
Last Action Hero	2	23-900 -GRN-GRN-	SAME	Not Used	Not Used
Tales from the Crypt	3	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	090-5041-00 25-1800 -BLU-GRN-
The Who's Tommy	3	090-5020-30 23-900 -GRN-GRN-	SAME	090-5041-00 25-1800 -BLU-GRN-	Not Used
WWF Royal Rumble	4	090-5032-00 22-1080 -YEL-GRN-	SAME	090-5041-00 25-1800 -BLU-GRN-	SAME
Guns N' Roses	3	090-5032-00 22-1080 -YEL-GRN-	SAME	090-5030-00 23-1100 -ORG-ORG-	Not Used
Maverick	3	090-5032-00 22-1080 -YEL-GRN	SAME	Not Used	090-5032-00 22-1080 -YEL-GRN-
Mary Shelley's Frankenstein	3	090-5030-00 23-1100 -ORG-ORG-	SAME	Not Used	090-5030-00 23-1100 -ORG-ORG-
Baywatch	4	090-5030-00 23-1100 -ORG-ORG-	090-5020-30 23-900 -GRN-GRN-	090-5025-00 24-1570 -See Note-	090-5030-00 23-1100 -ORG-ORG-
Batman Forever	3	090-5032-00 22-1080 -YEL-GRN -	090-5020-20 22-900 -YEL-YEL-	Not Used	090-5020-30 23-900 -GRN-GRN-
Apollo 13	2	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
Golden Eye	2	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
Twister	2	090-5020-20 22-900 -YEL-YEL-	090-5032-00 22-1080 -YEL-GRN-	Not Used	Not Used
ID4: Independence Day	3	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	090-5020-30 23-900 -GRN-GRN-
Space Jam †	2	090-5032-00T 22-1080 -YEL-GRN-	090-5020-20T 22-900 -YEL-YEL-	Not Used	Not Used
The Star Wars Trilogy - Special Edition †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
The Lost World: Jurassic Park †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
The X-Files †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
Starship Troopers †	3	090-5030-00T 23-1100 -ORG-ORG-	SAME	Not Used	090-5032-00T 22-1080 -YEL-GRN-
Viper Night Drivin' †	2	090-5030-00T 23-1100 -ORG-ORG-	SAME	Not Used	Not Used
Lost In Space †	2	090-5030-00T 23-1100 -ORG-ORG-	090-5032-00T 22-1080 -YEL-GRN-	Not Used	Not Used
Godzilla †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
South Park †	2	090-5030-00T 23-1100 -ORG-ORG-	SAME	Not Used	Not Used
Harley-Davidson® † and Harley-Davidson® 2nd Ed. †	2	090-5032-00T 22-1080 -YEL-GRN -	090-5030-00T 23-1100 -ORG-ORG-	Not Used	Not Used
Striker Xtreme (NFL) †	3	090-5032-00T 22-1080 -YEL-GRN-	090-5030-00T 23-1100 -ORG-ORG-	090-5030-00T 23-1100 -ORG-ORG-	Not Used
Sharkey's Shootout †	3	090-5030-00T 23-1100 -ORG-ORG-	SAME	090-5030-00T 23-1100 -ORG-ORG-	Not Used
High Roller Casino †	2	090-5020-20T 22-900 -YEL-YEL-	090-5032-00T 23-1080 -YEL-GRN-	Not Used	Not Used
Austin Powers™ †	2	090-5020-30 23-900 -GRN-GRN-	090-5030-00T 23-1100 -ORG-ORG-	Not Used	Not Used
MONOPOLY® †	3	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	090-5062-00T 23-1500 -BLU-BLU-
Playboy †	2	090-5030-00T 23-1100 -ORG-ORG-	SAME	Not Used	Not Used
RollerCoaster Tycoon TM †	4	090-5032-00T 22-1080 -YEL-GRN-	SAME	090-5067-00T 25-1400 -RED-RED-	090-5068-00T 25-1600 -WHT-WHT
	6* (5 with	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	090-5030-00T 23-1100 -ORG-ORG-
The Simpsons™ Pinball Party †	Flipper	* The Homer Head Ass Upr. Rt. Style Flipper		Flippers (Mini-Bats) o 090-5041-00T	n 2nd Level Playfield:
	Bats)	Upr. Rt. Style Flipper (no E.O.S. Switch):	* 090-5020-20T 22-900 -YEL-YEL-	090-5041-001 25-1800 -BLU-GRN-	090-5025-00T 24-1570 -See Note-
Terminator® 3: Rise of the Machines™ †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
The Lord of the Rings TM †	2	090-5020-20T 22-900 -YEL-YEL-	SAME	Not Used	Not Used
Ripley's Believe It or Not!® †	3	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	090-5067-00T 25-1400 -RED-RED-

[†] Coil Part Nos ending with a "T" signifies the Diode is on the top of the lug (on the coil-winding side); Coil Part Nos ending with a "B" signifies the Diode is on the bottom of the lugs.





APPENDIX F Motor Specification (White Star Board System* Only) Table



Game Name	Function	Specifications	Part Numer
	Rocket	Bowman Motor 24VAC	515-6383-00
Apollo 13	Up/Down Movement Moon Unit	60Hz 3W 6 RPM CCW Multi Products Motor 24VAC	incl. Connector 515-6487-00
•	Rotational Orbit Shaker	50/60Hz 3W 6 RPM CCW Johnson Motor (Vibrator) 10.5VDC	incl. Connector 041-5029- 00
Colden Fire	Satellite	10 AMP 2950 RPM CW Bowman Motor 24VAC	MOTOR ONLY 515-6528-00
Golden Eye	Left/Right Movement Spinning Disc	60Hz 3W 6 RPM CW Multi Products Motor 24VAC (041-5026-00)	incl. Connector 515-6347-00
Twister	with Magnet	50/60Hz 3W 325 RPM CCW	incl. Connector
	Backbox Fan (Tornado Wind)	Multi Products Motor 24VAC (041-5052-00) 50/60Hz 3W 3600 RPM CW	515-6531-00 incl. Connector
ID4: Independence Day	Alien Head Open/Close Movement	Servo Motor <i>(94322)</i>	041-5045-00 MOTOR ONLY
SPACE JAM (NO MOTOR USED) The Star Wars Trilogy - S.E.	X-Wing	Bowman Motor 24VAC (041-5058-00)	515-6383-01
THE Stat Wats THIOGY - S.E.	Left/Right Movement Snagger & Center Link	60Hz 3W 10 RPM CCW Multi Products Motor 20VDC (041-5059-03)	<u>incl. Connector</u> 515-6715-03
The Lost World: Jurassic Park	Lift Up/Down Movement	9 RPM Non-Directional	incl. Connector
ourussis i urk	Shaker	Johnson Motor (Vibrator) 10.5VDC 10 AMP 2950 RPM CW	041-5029- 00 <i>MOTOR ONLY</i>
The X-Files	X-File Cabinet Lift Up/Down Movement	Multi Products Motor 20VDC 9 RPM CCW	041-5057-00 <i>MOTOR ONLY</i>
Starship Troopers	Warrior Bug Forward/Reverse Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W (041-5062-00), Series 36000: 1.4"ø (Non-Captive Shaft not included) HSI #36864-12 (Unipolar) Travel per Step: .004 Step Angle: 15°	515-6794-00 incl. Connector Requires 7" Shaft: 530-5503-00
VIPER NIGHT DRIVIN' (NO MOTOR USE	T'		
Lost In Space	Spinning Disc with Magnet	Multi Products Motor 24VAC (041-5046-00) 50/60Hz 3W 325 RPM CCW	515-6347-00 incl. Connector
Godzilla	Shaker ‡	Multi #3811 0630 Motor (Vibrator) 12VDC 3100 RPM CW (w/DRL PTS) ‡	041-5029 -01 <i>MOTOR ONLY</i>
SOUTH PARK (NO MOTOR USED)	Challey *	Multi #3811 0630 Motor (Vibrator) 12VDC	041-5029 -01
Harley-Davidson® 1st through 3rd Editions	Shaker ‡ Motorcycle	3100 RPM CW (w/DRL PTS) ‡ Autotrol 24VAC (041-5072-02)	MOTOR ONLY 515-7025-00
	Lift Up/Down Movement	20 RPM CCW	incl. Connector
Striker Xtreme (NFL)	Goalie (Linebacker) Left to Right Movement	Multi #3590 12VDC <i>(041-5075-00)</i> 60 RPM	515-7071-00 incl. Connector
Sharkey's Shootout	Mystery Ball Rotating Movement	Hankscraft Motor Model-E 24VAC (041-5076-00) 50/60Hz 3W 20 RPM CW	515-7095-00 incl. Connector
	Roulette Wheel Rotating Movement	Multi Products Motor 20VDC (041-5078-00) 17 RPM CCW	515-7153-00 incl. Connector
High Roller Casino	Up/Dn. Ramp in Slot Mach. Lift Up/Down Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W (041-5062-00), Series 36000: 1.4*ø (Non-Captive Shaft not included) HSI #36864-12 (Unipolar) Travel per Step: .004 Step Angle: 15°	515-6794-00 <u>incl. Connector</u> Requires Shaft 4 ¹ / ₄ ": 530-5503-01
	Time Machine Rotating Movement	Multi Products Motor 24VAC (041-5079-00) 50/60Hz 20RPM CCW	515-7141-00 incl. Connector
Austin Powers™	Laser Beam Left to Right Directional	Autotrol Motor 24VAC (041-5081-00) 50/60Hz 4W 10RPM Bi-Directional	515-7171-00 incl. Connector
	Dr. Evil Target Lift Up/Down Movement	Hankscraft Motor Model-E 24VAC (041-5030-00) 50/60Hz 6RPM CCW	515-5900-00 incl. Connector
Monopoly®	Mini-Flipper (Waterworks) Rotating Movement	Multi Prod. Motor & Gear Box #7000 EX00159A 20VDC 50/60Hz 85RPM CC/CCW	041-5083-00
	Triangular Billboard Rotating Movement	Autotrol Motor (BD511 150-1387) 24VAC 50/60Hz 12RPM Bi-Directional	MOTOR ONLY 041-5086-02 MOTOR ONLY
Disabase	Centerfold Mechanism Open/Close Movement	Multi Products (3680) Motor 12v DC 10/12 RPM CC/CCW	041-5075-04
Playboy	Tease Drop Screen Lift Up/Down Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W (041-5062-00), Series 36000: 1.4"ø (Non-Captive Shaft not included) HSI #36864-12 (Unipolar) Travel per Step: .004 Step Angle: 15°	MOTOR ONLY 515-6794-00 incl. Connector Requires 7" Shaft: 530-5503-00

"-01" Shaker Motor is **Not Compatible** with old Shaker Motor 041-5029-**00** (Shaker Motor Assy. 515-5893-00).
THIS NEW MOTOR CAN ONLY BE USED IN NEW SHAKER MOTOR ASSY. 515-5893-**01**.

Table continued on the next page. ‡ Please Note:

Appendix F:

Motor Specification Table





Motor Specification (White Star Board System* & S.A.M. System** Only) Table



Game Name	Function	Specifications	Part Number
ROLLERCOASTER TYCOON™ (NO MC THE SIMPSONS™ PINBALL PARTY (NO	,		
Terminator® 3: Rise of the Machines™	Backbox Ball Shooter Up/Down Movement	Multi Products Motor 24VAC (041-5079-01) 21 RPM CW	515-7317-00 incl. Connector
The Lord of the Rings™	Balrog (Motor & Gate) Open/Close Movement	Multi Prod. Motor 20VDC Series 600B (or equiv.) 50/60Hz 10 RPM Bi-Directional	041-5088-01 MOTOR ONLY
RIPLEY'S BELIEVE IT OR NOT!® (NO M	OTOR USED)		
Elvis®	Elvis™ Front/Back Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 10W (041-5089-00), (Non-Captive Shaft not included) HSI #46868-12-002	500-6809-00 <u>incl. Connector</u> Requires 7.25" Shaft: 530-5658-00
	Shaker	Multi #3811 0630 Motor (<i>Vibrator</i>) 12VDC (041-5029- 01) 3100 RPM (w/DRL PTS)	515-5893-01 incl. Connector
The Sopranos ^{sм}	Bada Bing! Girls x2 Rotating Posts Movement	Autotrol Synchronous Motor 24VAC 4W 50/60Hz 45.7/54.9 RPM Bi-Directional	041-5092-00 w/1" Shaft + 12" Leads
NASCAR® and [NDSE]	Back Panel Rotating (Car) Windmill (Skill Ball Enter)	Multi Products Motor & Gear Box 20VDC Model #8000 (EX-04-073) 10 RPM	041-5093-00 MOTOR ONLY
Grand Prix	Back Panel Rotating (Car) Windmill (Skill Ball Enter)	Multi Products Motor & Gear Box 20VDC Model #8000 (EX-04-073) 10 RPM	041-5093-00 MOTOR ONLY
World Poker Tour™ (WPT) (NO MOTOR	USED)		
	Bart on Skateboard Left/Right Movement	Multi Products Motor with Crank 24VAC (041-5095-01) 50/60Hz 3W 14 RPM	500-6947-01 incl. Connector
The Simpons™ Kooky Carnival	Left & Right Ramps Up/Down Movement	Multi Products Motor 24VAC (041-5048-01) 50/60Hz 3W 15 RPM CCW (Qty. 2 in game)	515-7558-00 incl. Connector
	Shaker (details in SKC Manual, Page 24)	Multi #3811 0630 Motor (<i>Vibrator</i>) 12VDC 3100 RPM (w/DRL PTS)	041-5029 -01 MOTOR ONLY
©Disney's Pirates of the Caribbean	Spinning Disk	Multi #3811 R 0630 Motor (Vibrator) 12VDC (041-5029- 04) 3100 RPM (w/DRL PTS) -04 is RoHS compliant; can substitute with -01 domestic	511-5024-04 incl. Connector
of the Cambbean	Pirate Ship Sinking/Raising Movement	Multi Products Motor & Gear Box 24VDC Model #7000-DCM 12 RPM	041-5101-00 MOTOR ONLY
Family Guy™	Stewie Figurine Left & Right Movement	Stepper Motor NPM PF35T-48D4STD 5V RVB (041-5102-00 Reference Only)	511-5043-00 incl. Connector
Outles Manager	Doc Ock, Sandman & 3-Bank Up/Down Movement	Sync. Motor 24VAC 50/60Hz 3W 12 RPM CW (041-5103-00 Reference Only)	511-5063-00 incl. Connector
Spider-Man™	►►► OPTIONAL ◀◀◀ Shaker Motor Kit 502-5027-00	Multi #3811 R 0630 Motor (<i>Vibrator</i>) 12VDC (041-5029- 04) 3100 RPM (w/DRL PTS) -04 is RoHS compliant; can substitute with -01 domestic	515-5893-01 incl. Connector



APPENDIX F

Motor Specification Table

The following table only list games that	used motors. Part Num	bers starting with "515-" will include the Wiring F	larness & Connector.
Game Name	Function	Specifications	Part Nº
ABC Monday Night Football	Goal Post Up/Down Movement	Motor 24v A.C. 60 RPM CW	515-5222-00
Phantom of the Opera	Organ Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Checkpoint	Mag Wheel (in Backbox)	Motor D.C. (KEN)	041-5005-00
Спескропп	Shaker	Johnson Motor (Vibrator)	041-5002-00
Teenage Mutant Ninja Turtles	Spinning Pizza Ball Deflector	Gear Motor 24v A.C. 325 RPM CW	515-5397-00
Batman	Bar Target Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
	Swinging Target	Bowman Motor 24v 22½ RPM	515-5534-00
Star Trek 25th Anniversary	Transporter F/X	Gear Motor 24v A.C. 3½ RPM	500-5421-00
	Cooling Fan (for Transporter F/X)	4½" Motor 12v	041-5014-00
Lethal Weapon 3	Spinning Light	Motor 2½ v A.C. 4000 RPM CCW	041-5017-00
	Bar Target Up/Down Movement	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
Star Wars	R2D2 Robot Left/Right Movement	Bowman Motor 24v A.C. 22½ RPM CW	515-5571-00
	Death Star Rotation	Bowman "G" Motor 24v A.C. 60Hz 6 RPM CW	515-5570-00
Rocky & Bullwinkle & Friends	Nell Log "Cutting Blade" Forward/Back Movement	Autotrol Model E Motor 24v 60hz 4W 3 RPM CCW	041-5023-00
	T-Rex Left/Right Movement	Multi Motor 5v D.C.	041-5025-00
Jurassic Park	T-Rex Up/Down Movement	Bowman Motor 24v 11 RPM CW	041-5026-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Last Action Hero	Crane Left/Right Movement	Multi Products Motor 12v D.C. #3312 OSC	041-5027-00
Lust Addon Horo	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Tales from the Crypt	Tombstone Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
Tales from the Orypt	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
	Mirror Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
The Who's Tommy	Flipper Blinders	Servo Motor (94102)	041-5032-00
	Spinning Airplane Propellers	Motor D.C.	041-5033-00
WWF Royal Rumble	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Maverick, The Movie	Turning Paddle Wheel	Motor 24v A.C. 10 RPM	041-5036-00
Mary Shelley's Frankenstein	Creature Head Left/Right Movement	Servo Motor (94102)	041-5032-00
Batman Forever	Cannon Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00



APPENDIX G

Part Number Prefix Classification Codes

l.	010- 031-	cal Source, Energy & Signal Converters Transformers Speakers Solonoida (Coile)	VI.	355-	s, Locks, Catches, Latches, Keys Handles, Locks, Catches, Latches and Keys
	090- 150- 200-	Solenoids (Coils) Filters, Outlets, Varistors, Thermistors Fuses	VII.	390- 501-	ted Parts Hinges Coin Doors
II.	Conduction (Conduction Conduction	Ctors, Connectors & Insulators Line Cords Cable Assemblies & Wiring Harnesses Motors Connectors (All Types) Lugs (M/F), Pins (M/F), Discs, Ring Terminals, Terminal Strips, etc. Polarizing Keys and Conn. Covers Lamp Sockets		520- 522- 525- 530- 535- 545-	Sub-Assemblies Printed Circuit Boards (PCBs) Display Glass Wood Parts Screw Machined Parts Fabricated Parts Molded (Extruded) Plastic and Rubber Parts (Rings, Sleeves, etc.) Molded (Inserts)
III.		s & Circuit Elements ICs Transistors Diodes (All Types including LEDs & Modules) Resistors Resistors (Variable & Adjustable) Regulators & Bridge Rectifiers Capacitors (Radial Lytics & Ferrites)	VIII.	500- 502- 505- 510- 511- 515-	e Assemblies End Product (Systems and Models) Kits (Created In-House) Cabinets (complete) Riveted Sub-Assemblies (In-House) Sub-Assemblies (In-House) Sub-Assemblies* *2 or more 515-'s but still a sub-assembly.
	126- 127- 130- 140- 165- 180- 181- 190- 960- 965-	Piezo Crystal Heatsinks Capacitors (Tecates & Ceramics) Oscillators (Clocks/Crystals) Light Bulbs Switches Switch Membranes (Pads) & Piezo Sensors Relays EPROM (Raw Part) EPROM (Programmed Part)	IX.	601- 602- 604- 605- 625- 626-	Aterials Braided Wire & Ground Straps Stranded Wire Ribbon Cable Telephone Line Cord Sleeving (Shrink Tubing) Velcro (non-adhesive) Foam Rubber, Foam Pads, Rubber Bumpers (Blue Pads), Tape (All Types) Velcro (adhesive) and String / Rope
IV.	Bolts, \$231-232-234-237-240-242-244-245-246-281-	Screws, Nuts, Washers & Nails Bolts Screws (Pan Head) Screws (HWH) Screws (Misc.) Nuts (Misc.) Washers (Flat, Round) Washers (Split Lock) Nyliners Washers (Lockers, External Tooth) Nails	X.	040- 042- 091- 205- 631- 660- 675- 705- 755-	Tools (see also 777-) and Supplies Clamps, Ties & Clips Pulleys Coin Mechs Fuse Holders Staples Glass (Playfield, Backglass, etc.) Cleaners Packing & Shipping Items Instruction, Coin Cards, Ins. Sheets
V.	Mechai 249- 251- 254- 260- 265- 266- 267- 269- 270- 280- 283-	Rivets Pins (Dowel), Finishing Nails, Hairpins, Spring Pins and Clevis Pins Stand-Offs, Spacers and Shims Steel Ball (All Types Steel, Glowing, Delrin, etc.) Springs (Extension) Springs (Compression) Springs (Torsion) Springs (Washers - Belleville, Wave) Retaining Rings Grommets, Bushings and Nyliners Bearings		777- 780- 802- 820- 803- 830- 880- 900-	Information Sheets, Service Bulletins, Instruction Sheets in Kits and Templates Tools (Wrenches and Drivers) Manuals Decal Kits (comprised of 820's) Decals, Mylar and Labels (Sheets/Sets) Plastic Kits (comprised of 830's) Plastic Pieces (Butyrate Sheets/Sets) Toys, Models, Figurines, etc. Game Posters

Appendix G:



APPENDIX H

Playfield Inserts (Plastic Light Covers)

Patterns: STARBURST	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR
STIPPLE	5/8" Ø	3/4" Ø	1" Ø	1-3/ ₁₆ " Ø	1-1/2" Ø
	550-5000-XX	550-5001-XX	550-5002-XX	550-5003-XX	550-5004-XX
STARBURST CIRCULAR	STARBURST CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR
2- 1/4" Ø	2- 3⁄4" Ø	3/4" Ø	1" Ø	1-3/ ₁₆ " Ø	1-1/2" Ø
550-5005-XX	550-5006-XX	550-5007-XX	550-5008-XX	550-5009-XX	550-5010-XX
PLAIN CIRCULAR	PLAIN CIRCULAR	STIPPLE CIRCULAR	STIPPLE 1" SQUARE	ROLLOVER BUTTON BASE	WHITE STAR (only in white)
2- 1/4" Ø	2- ³ / ₄ " Ø	1" Ø	1211		
550-5011-XX	550-5012-XX	550-5048-XX	550-5019-XX	550-5026-XX	545-5015-00
STIPPLE RECTANGULAR	STIPPLE RECTANGULAR	STARBURST RECTANGULAR	PLAIN RECTANGULAR	PLAIN RECTANGULAR	PLAIN RECTANGULAR
1-1/2" X 3/4" 550-5018-XX	1-5/8" X 1-1/2" 550-5051-XX	2-1/4" X 1-1/8" 550-5044-XX	2-1/4" X 1-1/8" 550-5049-XX	1-1/4" X 1-1/2" 550-5050-XX	2" X 2-½" 550-5063-XX
1-1/2" X 3/4"	1-5/8" X 1-1/2"	2-1/4" X 1-1/8"	2-1/4" X 1-1/8"	1-1/4" X 1-1/2"	2" X 2-1/2"
1-1/2" X 3/4" 550-5018-XX STARBURST	1-5/8" X 1-1/2" 550-5051-XX STARBURST	2-1/4" X 1-1/8" 550-5044-XX	2-1/4" X 1-1/8" 550-5049-XX BEVEL	1-1/4" X 1-1/2" 550-5050-XX PLAIN	2" X 2-½" 550-5063-XX
1-1/2" X 3/4" 550-5018-XX STARBURST MINI SHIELD	1-5/8" X 1-1/2" 550-5051-XX STARBURST	2-1/4" X 1-1/8" 550-5044-XX MINI HOT DOG	2-1/4" X 1-1/8" 550-5049-XX BEVEL HOT DOG	1-1/4" X 1-1/2" 550-5050-XX PLAIN HOT DOG	2" X 2-½" 550-5063-XX
1-½" X ¾" 550-5018-XX STARBURST MINI SHIELD 1" X 1"	1-5/8" X 1-1/2" 550-5051-XX STARBURST LARGE SHIELD	2-1/4" X 1-1/8" 550-5044-XX MINI HOT DOG 1-5/8"	2-1/4" X 1-1/8" 550-5049-XX BEVEL HOT DOG 3-1/2"	1-1/4" X 1-1/2" 550-5050-XX PLAIN HOT DOG 3-1/2"	2" X 2-1/2" 550-5063-XX BANANA
1-1/2" X 3/4" 550-5018-XX STARBURST MINI SHIELD 1" X 1" 550-5024-XX STARBURST	1-5/8" X 1-1/2" 550-5051-XX STARBURST LARGE SHIELD 550-5025-XX STARBURST	2-1/4" X 1-1/8" 550-5044-XX MINI HOT DOG 1-5/8" 550-5020-XX STARBURST ARROW-HEAD	2-1/4" X 1-1/8" 550-5049-XX BEVEL HOT DOG 3-1/2" 550-5021-XX STARBURST ARROW-HEAD	1-1/4" X 1-1/2" 550-5050-XX PLAIN HOT DOG 3-1/2" 550-5022-XX STARBURST	2" X 2-½" 550-5063-XX BANANA 550-5023-XX STARBURST

Instructions:

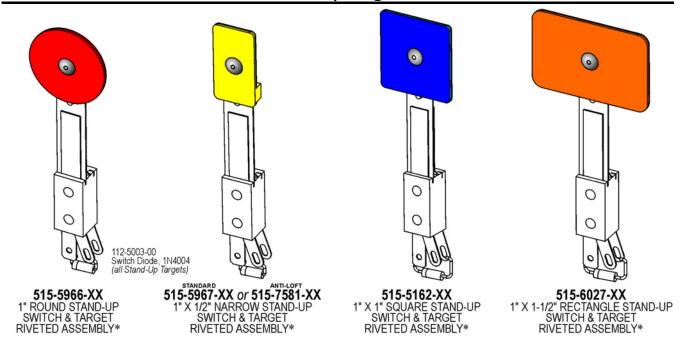
Parts which may come in various colors (i.e. targets, some posts, playfield inserts, etc.) end in a 2-digit number which correspond to the color of that part. The "-XX" in part number which may come in various colors should be replaced with the desired 2-Digit number corresponding to the color desired below. Not all colors may be available.

	PLASTIC PART COLOR CHART											
Nº	Color	No	Color	Nº	Color	Nº	Color	Nº	Color	Nº	Color	
-00	Black or Solid Clear	-03	Amber	-06	Yellow	-09	Purple	-12	Fluor. Blue	-15	Luminescent	
-01	Clear	-04	Green	-07	Orange	-10	Fluor. Orange	-13	Teal Green	-16	Gold	
-02	Red	-05	Blue	-08	White	-11	Fluor. Green	-14	Gray	-17	Trans. Brown	



APPENDIX I

Stand-Up Targets

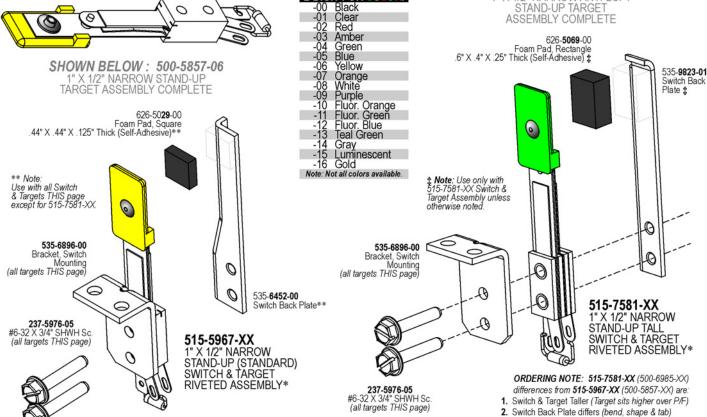


*Note: Does not include the Switch Back Plate, Mounting Bracket or screws.

To include the Switch Back Plate, Foam Pad, and Switch Mounting Bracket assembled, use the follow assembly part numbers (replace the -XX with 2-digit number from chart): 500-5321-XX : 1" X 1-1/2" RECT. TARGET

500-5835-XX: 1" ROUND TARGET 500-5857-XX : 1" X 1/2" NARROW TARGET 500-6985-XX : 1" X 1/2" ANTI-LOFT TARGET 500-5232-XX: 1" X 1" SQUARE TARGET

-XX REPLACE WITH 2-DIGIT FOR COLOR **REAR VIEW 515-5967-06 SHOWN** SHOWN BELOW: 500-6985-04 1" X 1/2" NARROW ANTI-LOFT STAND-UP TARGET



*Note: Does not include the Switch Back Plate, Mounting Bracket or screws.

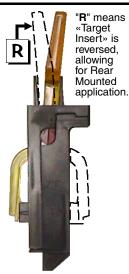
Appendix I:



3. Foam Pad differs (thicker, taller, different type foam)

APPENDIX I

Modular Stand-Up Targets















-XX F 2-DIG	REPLACE WITH IT FOR COLOR:
-00	Black
-N1	Clear
-02	Red Amber Green Blue
-03	Amber
-04	Green
-05	Blue
-06	Yellow
-07	Orange
-08	White
-09	Purple
-10	Fluor. Orange
-11	Fluor. Green
-12 -13	Fluor. Blue Teal Green
-14	Gray
-15	Gray Luminescent
-16	Gold
	ot all colors available

To Replace the « Target Insert » or change Target Orientation:

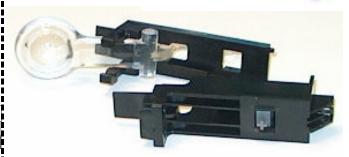
Items A-E Note: For the Target Assembly use the "500-" SPI Part Number(s) shown in the Parts Table below. To receive the Target Assembly with the « Target Insert » « Reversed » simply add a "R" at the end of the Part Number. See Side View picture left to compare (dashed line shows target reversed). For just the «Target Insert» use the "545-" SPI Part Number.



To reverse it yourself or to just change the insert:

1. With a small flat head screwdriver, push into the small tab at the bottom of the target front and give a slight twist motion to "pop" the two halves.

2. Push the Target Insert bottom in at the same time while you slide the top (front) part up, then let go of the insert as the two halves come apart.



3. Replace target or reinsert it into the other size while sliding the two halves back together.

Note: If you were reversing the orientation, don't forget to also turn the Switch Actuator PCB 180°. Test Switch.

Take Note:

Items A-E come in various colors. These targets may not be available in every color. The "-XX" in should be replaced with the desired 2-Digit number for the color desired as described in the Color Chart below. As of print date, the following colors were used:

-01 Clear (A, D); -02 Red (A, B, C, D, E); -03 Amber (D, E); -04 Green (A, B); -05 Blue (C); -06 Yellow (A, C),
-09 Purple (B, D); -11 Fluorescent Green (A, B, D)
2. For location(s) and type of Stand-Up
Targets used, if any, see Section 4, Chapter 1,
Parts Identification & Location.

Nr.	STAND-UP TARGET PARTS	SPI PART Nr.
	Modular Stand-Up Target Narrow Assy.	500-6138-XX
Α	Stand-Up Target Narrow (Insert)	545-6138-XX
ъ	Modular Stand-Up Target Square Assy.	500-6139-XX
В	Stand-Up Target Square (Insert)	545-6139-XX
С	Modular Stand-Up Target Rectangle Assy.	500-6228-XX
C	Stand-Up Target Rectangle (Insert)	545-6228-XX
D	Modular Stand-Up Target Round Assy.	500-6075-XX
U	Stand-Up Target Round (Insert)	545-6075-XX
_	Mod. Stand-Up Target 1" Spherical Assy.	500-6189-XX
	Stand-Up Target 1" Spherical (Insert)	545-6189-XX

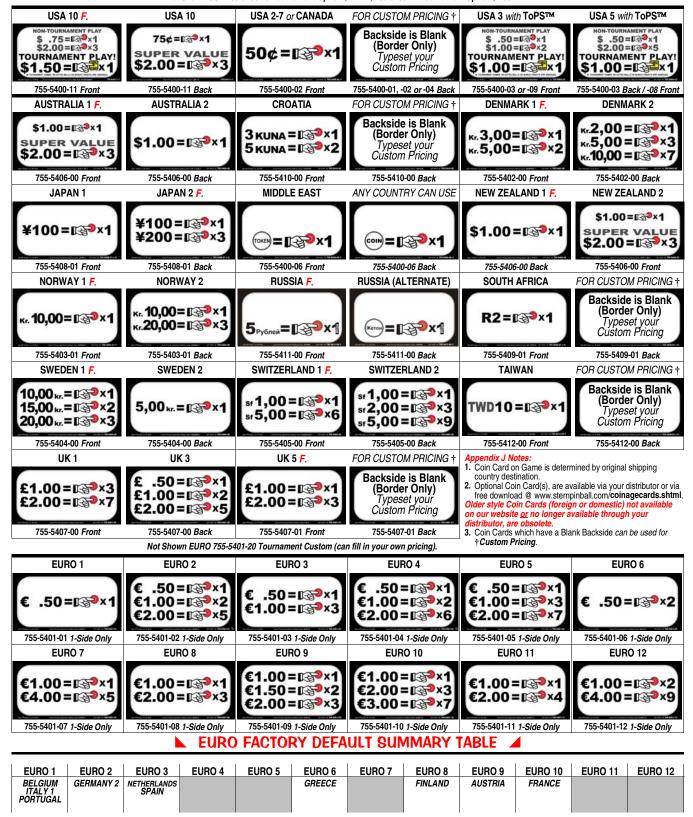




APPENDIX J

Coin Cards (USA & International Pricing Defaults) ▶ For Yellow Stock add -Y to the Part Number

If more than one Pricing Scheme is available for countries listed, the **F.** listed beside the option, denotes the Factory Default Setting. **FOR VIEWS OF THE LATEST or OPTIONAL USA, INTERNATIONAL / EURO AND CUSTOM COIN CARDS, VISIT OUR WEBSITE.**Not Shown USA 755-5400-10 Tournament Option \$2 = X1; 755-5400-11 Tournament Option \$1.50 = X1



Section 3, Chapter 4, GO TO ADJUSTMENTS MENU, Adj. 18, Game Pricing, USA & International (non-Euro) and Euro 1-12 Summary & International (Euro) Standard Pricing Select Tables, summarizes Standard or Custom Pricing Schemes & the Dip Switch Setting required.





Pinball Game Firmware (White Star Board System* Only) Table See website for the latest International Code or Updated USA version / checksums



ROM	Chip Size	Program Part Nº	USA ver. & Check Sum	Bd. Loc.	Raw Part Nº	ROM	Chip Size	Program Part Nº	USA ver. & Check Sum	Bd. Loc.	Raw Part Nº
						Harley-I Game R Sound Display Voice 1 Voice 2 Voice 3 Voice 4	Davidson@ OM (1M) (512K) (4M) (8M) (8M) (8M) (4M)	9(Notes 4, 5 965-0319-67 965-0320-67 965-0321-67 965-0322-67 965-0323-67 965-0325-67	5, 6) Original A1.03 \$3EFF 1.00 \$F4FF A1.04 \$FC7C 1.00 \$C026 1.00 \$9396 1.00 \$FB72 1.00 \$6100	(1999-200 U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00 960-5015-01
Apollo 13 (Game ROM Sound Display Voice 1 Voice 2 Voice 3		965-0208-00 965-0212-00 965-0213-00 965-0209-00 965-0210-00 965-0211-00	A5.01 \$09FF 1.00 \$5244 A5.00 \$B92B 1.00 \$7FC7 1.00 \$8E55 1.00 \$08EE	U210 U7 ROM 0 U17 U21 U36	960-5009-00 960-7001-02 960-5015-01 n/a (masked) n/a (masked) n/a (masked)	Game R Display ► Harl Game R Display	OM (1M) (4M) ey-Davidso OM (1M) (4M)	965-0319-67A 965-0321-67A n® (Notes 4, 965-0319-87 965-0321-87	5, 6, 8) <i>2nd Edi</i>	tion (2002- U210 ROM 0	2003) 960-5009-00 960-5015-01 960-5009-00 960-5015-01
Golden Eye Game ROM Sound Display Voice 1 Voice 2	(1M) (512K) (4M) (4M) (4M)	965-0214-42 965-0217-42 965-0218-42 965-0215-42 965-0216-42	A4.04 \$3FFF 1.00 \$D615 A4.00 \$E6ED 1.00 \$3E32 1.00 \$71F0	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 n/a (masked) n/a (masked)	Striker 2 Game R Sound Display Voice 1 Voice 2 Voice 3 Voice 4	Xtreme (N OM (1M) (512K) (4M) (8M) (8M) (8M) (8M)	otes 4, 5) 965-0326-68 965-0327-68 965-0328-68 965-0329-68 965-0330-68 965-0331-68 965-0332-68	A1.03 \$E4FF 1.00 \$3BCA A1.03 \$1957 1.00 \$482A 1.00 \$7312 1.00 \$DE2F 1.00 \$C508	U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-00 960-5016-00 960-5016-00 960-5016-00
Twister (No Game ROM Sound Display Voice 1 Voice 2	(1M) (512K) (4M) (4M) (4M)	965-0219-41 965-0221-41 965-0222-41 965-0220-41 965-0223-41	A4.05 \$E9FF 1.00 \$1FFF A4.00 \$FD01 1.00 \$3650 1.00 \$9300	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	NFL (No Game R Sound Display Voice 1 Voice 2 Voice 3		Not on CD-R or 965-0339-73 965-0340-73 965-0341-73 965-0342-73 965-0343-73 965-0344-73	Mebsite: Code (A1.00 \$D2FF 1.00 \$ A1.01 \$845A 1.00 \$ 1.00 \$ 1.00 \$	through Dist	
Game ROM Sound Display Voice 1 Voice 2	(1M) (512K) (4M) (4M) (4M)	965-0224-45 965-0227-45 965-0228-45 965-0225-45 965-0226-45	A2.02 \$9CFF 1.00 \$222B A2.00 \$ABF7 1.00 \$3AE1 1.00 \$206E	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	Voice 4	's Shoote	965-0333-72 965-0333-72		U210 U7 ROM 0	960-5009-00 960-7001-02
Space Jam Game ROM Sound Display Voice 1 Voice 2 Voice 3	(1M) (512K) (4M) (4M) (4M) (4M) (4M)	965-0229-43 965-0233-43 965-0234-43 965-0230-43 965-0231-43 965-0232-43	A3.00 \$E6FF 1.00 \$F1E7 A3.00 \$0057 1.00 \$DBA8 1.00 \$DDF1 1.00 \$F32A	U210 U7 ROM 0 U17 U21 U36	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01	Voice 2 Voice 3	(8M) oller Casin	965-0335-72 965-0336-72 965-0337-72 965-0338-72 965-0348-65 965-0346-65 965-0347-65 965-0348-65	5)	U21 U36	960-5015-01 960-5016-00 960-5016-00 960-5016-00 960-5009-00 960-7001-02 960-5015-01
The Star W Game ROM Sound Display Voice 1 Voice 2	/ars Tril (1M) (512K) (4M) (4M) (4M)	ogy - Speci 965-0235-56 965-0238-56 965-0239-56 965-0236-56 965-0237-56	al Edition (S. A4.03 \$5EFF 1.00 \$4A7D A4.00 \$8817 1.00 \$866B 1.00 \$8F54	E.) (Not U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	Voice 1 Voice 2 Voice 3 Voice 4	(8M) (8M) (8M) (8M) Powers TM	965-0349-65 965-0350-65 965-0351-65 965-0352-65	A3.00 \$90FF 1.00 \$581C A3.00 \$74B3 1.00 \$E12D 1.00 \$38F4 1.00 \$1B54 1.00 \$D720		960-5016-00 960-5016-00 960-5016-00 960-5016-00
The Lost V Game ROM Sound Display Voice 1 Voice 2		urassic Par 965-0240-53 965-0243-53 965-0244-53 965-0241-53 965-0242-53	k (Note 2) A2.02 \$C8FF 1.00 \$A35B A2.01 \$7F46 1.00 \$1D27 1.00 \$8DA4	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	Sound Display Voice 1 Voice 2 Voice 3 Voice 4	(512K) (4M) (8M) (8M) (8M) (8M)	965-0354-74 965-0335-74 965-0356-74 965-0357-74 965-0358-74 965-0359-74	A3.02 \$5DFF 1.00 \$DA7B A3.00 \$6A34 1.00 \$02B9 1.00 \$9E75 1.00 \$51F3 1.00 \$0AE5	U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00
The X-Files Game ROM Sound Display Voice 1 Voice 2		965-0245-46 965-0248-46 965-0249-46 965-0246-46 965-0247-46	A3.03 \$A2FF 1.00 \$6648 A3.00 \$66D0 1.00 \$349D 1.00 \$629C	U210 U7 ROM 0 U17 U21	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01	MONOF Game R Sound Display Voice 1 Voice 2 Voice 3	OLY® (No OM (1M) (512K) (4M) (8M) (8M) (8M)	965-0360-75 965-0361-75 965-0362-75 965-0363-75 965-0364-75 965-0365-75	A3.20 \$07FF 1.00 \$8C18 A3.01 \$A381 1.00 \$35E6 1.00 \$835A 1.00 \$8A9F	U210 U7 ROM 0 U17 U21 U36	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00
Starship To Game ROM Sound Display Voice 1 Voice 2 Voice 3	(512K) (4M) (4M) (4M) (4M)	965-0253-59 965-0254-59 965-0251-59 965-0252-59 965-0255-59	A2.00 \$85FF 1.00 \$64B2 A2.00 \$577B 1.00 \$152A 1.00 \$0291 1.00 \$95A7	U210 U7 ROM 0 U17 U21 U36	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01	Playboy Game R Sound Display Voice 1 Voice 2 Voice 3 Voice 4	V (Notes 4, OM (1M) (512K) (4M) (8M) (8M) (8M) (8M)	5, 7) 965-0367-76 965-0368-76 965-0369-76 965-0370-76 965-0371-76 965-0372-76 965-0373-76	A5.00 \$7DFF 1.02 \$E7C2 A5.00 \$A5FF 1.00 \$9ABE 1.00 \$9734 1.00 \$374B 1.00 \$237A	U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00 960-5016-00
Viper Nigh Game ROM Sound Display Voice 1 Voice 2 Voice 3 Voice 4		965-0266-35 965-0271-35 965-0272-35 965-0267-35 965-0268-35 965-0269-35 965-0270-35	A2.01 \$C5FF 1.00 \$4DF8 A2.01 \$C17D 1.00 \$8018 1.00 \$2157 1.00 \$B5A6 1.00 \$D01E	U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01 960-5015-01	RollerC Sound Game R Voice 1 Voice 2 Voice 3 Display	(512K)	965-0374-78 965-0375-78 965-0377-78 965-0377-78 965-0378-78 965-0379-78 965-0376-78	es 4, 5, 7) 1.00 \$F663 A7.02 \$E5FF 1.00 \$3C4A 1.00 \$057A 1.00 \$04D7 A7.01 \$8DDB	U7 U210 U17 U21 U36 U5 Disp. C	960-7001-02 960-5009-00 960-5016-00 960-5016-00 960-5016-00 ntrlr.
Lost In Spa Game ROM Sound Display Voice 1 Voice 2 Voice 3 Voice 4		965-0282-60 965-0287-60 965-0288-60 965-0288-60 965-0284-60 965-0285-60 965-0286-60	A1.01 \$B2FF 1.00 \$A6AF A1.02 \$32AB 1.00 \$4391 1.00 \$6215 1.00 \$5B32 1.00 \$8971	U210 U7 ROM 0 U17 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01 960-5015-01	The Sim Sound Game R Voice 1 Voice 2 Voice 3 Voice 4 Display	(512K)	inball Party 965-0381-77 965-0382-77 965-0383-77 965-0384-77 965-0385-77 965-0386-77 965-0387-77	(Notes 4, 5, 7 1.01 \$A7EE A4.00 \$4FFF 1.00 \$9719 1.00 \$16ED 1.00 \$ADCE 1.00 \$E7E5 A4.00 \$8A03	7\	960-7001-02 960-5009-00 960-5016-00 960-5016-00 960-5016-00 960-5015-01 B 960-5015-01
Godzilla (N Game ROM Sound Display Voice 1 Voice 2 Voice 3 Voice 4		965-0289-40 965-0294-40 965-0295-40 965-0290-40 965-0291-40 965-0292-40 965-0293-40	A2.05 \$B1FF 1.00 \$0CC8 A2.00 \$C929 1.00 \$0D75 1.00 \$CCCF 1.00 \$227F 1.00 \$DB69	U210 U7 ROM 0 U17 U21 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5015-01 960-5015-01 960-5015-01 960-5015-01	Termina Sound Game R Voice 1 Voice 2 Voice 3 Voice 4 Display	(512K)	965-0388-79 965-0389-79 965-0390-79 965-0390-79 965-0392-79 965-0393-79 965-0394-79	Achines TM (N 1.00 \$D2FD A4.00 \$F8FF 1.00 \$1838 1.00 \$1905 1.00 \$89DA 1.00 \$1200 A4.00 \$6E49	otes 4, 5, U7 U210 U17 U21 U36 U37	7) 960-7001-02 960-5009-00 960-5016-00 960-5016-00 960-5016-00 960-5015-01
South Park Game ROM Sound Display Voice 1 Voice 2 Voice 3 Voice 4		965-0301-71 965-0306-71 965-0307-71 965-0302-71 965-0303-71 965-0304-71 965-0305-71	A1.03 \$58FF 1.00 \$1286 A1.01 \$166F 1.00 \$7BF8 1.00 \$9CCC 1.00 \$ADD9 1.00 \$6659	U210 U7 ROM 0 U17 U21 U21 U36 U37	960-5009-00 960-7001-02 960-5015-01 960-5016-00 960-5016-00 960-5016-00 960-5016-00	The Lor Sound Game R Voice 1 Voice 2 Voice 3 Voice 4 Display	(512K)	ings TM (Note 965-0401-80 965-0402-80 965-0403-80 965-0404-80 965-0406-80 965-0407-80		U7 U210 U17 U21 U36 U37 U5 DC PC	960-7001-02 960-5009-00 960-5016-00 960-5016-00 960-5016-00 960-5016-00 B 960-5015-01





🛚 Pinball Game Firmware (White Star Board System* & S.A.M. System** Only) Table 🛒 🕍 ode or Updated USA version / checksums

٧		See web			
ROM	Chip Size	Program Part Nº	USA ver. & Check Sum	Bd. Loc.	Raw Part Nº
pley's Be	lieve It	t or Not!® (N	lotes 7, 8)	117	000 7001 00
Sound Game ROM	(512K) (1M)	965-0408-81 965-0409-81	1.00 \$D93D A3.20 \$43FF 1.00 \$067B 1.00 \$C8B8 1.00 \$64C2 1.00 \$5341	U7 U210	960-7001-02 960-5009-00 960-5016-00
Game ROM Voice 1 Voice 2	(1M) (8M) (8M)	965-0409-81 965-0410-81 965-0411-81	1.00 \$067B	Ü210 U17 U21	960-5016-00
Voice 2 Voice 3	(8M)	965-0411-81	1.00 \$C8B8	U36 U37	960-5016-00
Voice 3 Voice 4	(8M) (8M) (4M)	965-0412-81 965-0413-81 965-0414-81	1.00 \$5341 A3.00 \$DE4B	U37	960-5016-00 960-5016-00 960-5016-00 960-5015-01
Display			A3.00 \$DE4B	US DC PC	3 960-3013-01
vis® (Not Sound	(512K)	965-0415-84	1.00 \$8CD2	U7	960-7001-02
Game ROM	(1M) (8M)	965-0416-84 965-0417-84	A5.00 \$50FF	Ŭ210 U17 U21	960-7001-02 960-5009-00 960-5016-00
Voice 1 Voice 2	(MA)	965-0418-84	1.00 \$538D 1.00 \$8BCD	U21	960-5016-00
Voice 3 Voice 4	(8M) (8M)	965-0419-84	1.00 \$8CD2 A5.00 \$50FF 1.00 \$538D 1.00 \$8BCD 1.00 \$60F8 1.00 \$14D8	Ú36	960-5016-00
Display	(4M)	965-0420-84 965-0421-84	1.00 \$8CD2 A5.00 \$50FF 1.00 \$538D 1.00 \$8BCD 1.00 \$60F8 1.00 \$14D8 A5.00 \$A1F6	U5 DC PCE	960-5016-00 960-5016-00 960-5016-00 3 960-5015-01
e Soprar	nos sm (N	lotes 7. 8)			
Sound	(512K) (1M)	Notes 7, 8) 965-0422-85 965-0423-85	4.00 \$9B5A A5.00 \$5BFF	U7	960-7001-02
Game ROM	(IM) (8M)	965-N/2/I-85	3.00 \$5BFF	Ú210 U17	960-5009-00 960-5016-00
Voice 1 Voice 2 Voice 3	(8M)	965-0425-85	3.00 \$F01E 1.04 \$C14C 1.04 \$47A3	Ü21	960-5016-00
Voice 3 Voice 4	(8M) (8M) (8M) (8M)	965-0425-85 965-0426-85 965-0427-85	1 ()4 SAD(3)	U17 U21 U36 U37	960-5016-00 960-5016-00 960-5016-00 960-5016-00
Display	(4M)	965-0428-85	A5.00 \$B4BB	ŬŠ DC PCE	3 960-5015-01
ASCAR®	(Notes	7, 8)			
Sound Game ROM	(512K) (1M)	965-0429-86 965-0430-86	2.00 \$32B3 A4.50 \$39FF 2.00 \$CFFB 2.00 \$22C0 2.00 \$5FC8 2.00 \$2902	U7 U210	960-7001-02 960-5009-00
Voice 1	(M8)	965-0431-86	2.00 SCFFB	U17	
Voice 1 Voice 2 Voice 3	(8M) (8M) (8M) (8M)	965-0431-86 965-0432-86 965-0433-86 965-0434-86	2.00 \$22C0 2.00 \$5FC8	U17 U21 U36 U37	960-5016-00 960-5016-00
Voice 4	(8M)	965-0434-86	2.00 \$2902	U37	960-5016-00
Display	(4M)	965-0435-86	A4.00 \$92BD	US DC PC	3 960-5015-01
and Prix	(Notes	7, 8)	V1 00 ¢6E90	U7	960-7001-02
Sound Game ROM	(512K) (1M)	965-0429-91 965-0430-91	V1.00 \$6F89 A4.50 \$5EFF 1.00 \$CE0E 1.00 \$F4C6 1.00 \$057D 1.00 \$2646	11210	960-5009-00
Voice 1	(M8)	965-0431-91	1.00 \$CE0E	U17	960-5016-00
Voice 1 Voice 2 Voice 3	(8M) (8M) (8M)	965-0432-91 965-0433-91 965-0434-91	1.00 \$F4C6	U17 U21 U36 U37	960-5016-00 960-5016-00 960-5016-00
Voice 4	(8M) (4M)	965-0434-91 965-0435-91	A4.50 \$5EFF 1.00 \$CEOE 1.00 \$F4C6 1.00 \$057D 1.00 \$2646 A4.00 \$DA8E	U37	960-5016-00 3 960-5015-01
Display					
DSE] (No	(512K)	965-0436-97	ore info if co	U7	e required.
Sound Game ROM	(512K) (1M)	965-0436-97 965-0437-97		U210	960-7001-02 960-5009-00
Voice 1 Voice 2	(8M) (8M)	965-0438-97		U17 U21	960-5016-00
Voice 3	(8M)	965-0439-97 965-0440-97		U36	960-5016-00 960-5016-00
Voice 4 Display	(8M) (4M)	965-0441-97 965-0442-97		U37 U5 DC PCE	960-5016-00 3 960-5015-01
	` '		/T 001 11111 4 F		
GAMES B	ELOW I	HIS LINE / NE)	CT COLUMN AF	E S.A.W. S	YSTEM GAME
0.000			OTIOIC SAL		
			STICK W		
FROM	YOU	IR DISTR	IBUTOR,	USE SI	PI PART
FROM NUM	YOU BER	IR DISTR 970-012	IBUTOR, 8-00 &	USE SI	PI PART DE THE
FROM	YOU BER	IR DISTR 970-012	IBUTOR,	USE SI	PI PART
FROM NUM	YOU BER	IR DISTR 970-012	IBUTOR, 8-00 &	USE SI	PI PART DE THE
FROM NUM	YOU BER	IR DISTR 970-012	IBUTOR, 8-00 &	USE SI	PI PART DE THE
FROM NUM GAME	YOU BER NAM er Tour	IR DISTR 970-012 E / LANG	IBUTOR, 8-00 & UAGE FIL WPT) (Notes	USE SI INCLUD E(S) D	PI PART DE THE ESIRED.
FROM NUM GAME orld Poke Boot B-02	YOU BER NAM er Tour (8M)	Pinball (V 965-BOOT-SA	IBUTOR, 18-00 & UAGE FIL WPT) (Notes M 1.04 \$7562	USE SI INCLUIC E(S) D	PI PART DE THE ESIRED.
FROM NUM GAME orld Poke Boot B-02	YOU BER NAM er Tour (8M) kk 128MB	Pinball (V 965-B00T-SA (970-0128-00)	IBUTOR, 8-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version	USE SINCLUDE(S) D	PI PART DE THE ESIRED.
FROM NUM GAME orld Poke Boot B-02	PER NAM PER TOUT (8M) Rk 128MB English	IR DISTR 970-012 E / LANG TM Pinball (V 965-BOOT-SA (970-0128-00) + Spanish Profiles Only	BUTOR, 8-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version 1.12AL	USE SI INCLUID E(S) D 7, 9) U9 System 1.17+ 1.17+	PI PART DE THE ESIRED.
FROM NUM GAME orld Poke Boot B-02	PER NAM PER TOUT (8M) Rk 128MB English	IR DISTR 970-012 E / LANG TM Pinball (V 965-BOOT-SA (970-0128-00) + Spanish Profiles Only	IBUTOR, 28-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version 1.12AL 1.12A 1.12A 1.13AF	USE SI INCLUID E(S) D 7, 9) U9 System 1.17+ 1.17+	PI PART DE THE ESIRED. 960-5016-00 unprogramme Bin Files: WPT0112A-bit WPT0112A-bit WPT0112F-bit WPT0112F-bit
FROM NUM GAME orld Poke Boot B-02	YOU BER NAM er Tour (8M) ek 128MB English	Pinball (V 965-B0012-S) Pinball (V 965-B0013-S) (970-0128-S) (970-013-S) English Only French Only French Only French Only	IBUTOR, 28-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version 1.12AL 1.12A 1.12A 1.13AF	USE SI INCLUID E(S) D 7, 9) U9 System 1.17+ 1.17+ 1.17+ 1.17+	PI PART DE THE ESIRED. 960-5016-00 unprogramme Bin Files: WPT0112A-bit WPT0112A-bit WPT0112F-bit WPT0112F-bit
FROM NUM GAME orld Poke Boot B-02	YOU BER NAM er Tour (8M) ek 128MB English	IR DISTR 970-012 E / LANG TM Pinball (V 965-BOOT-SA (970-0128-00) + Spanish English Only + French French Only + French German Only	BUTOR, 8-00 & UAGE FIL WPT) (Notes M 1.04 \$7E62 Version 1.12AL	USE SI INCLUID E(S) D 7, 9) U9 System 1.17+ 1.17+	PI PART DE THE ESIRED.

SKC0105.bin SKC0090NJ.bin

System 1.23+ 1.23+ 1.23+ 1.23+

960-5016-00 unprogrammed

960-5016-00 unprogrammed Bin Files: POTC115AS.bin POTC115GF.bin POTC115AI.bin

960-5016-00 unprogrammed Bin Files: FG1000AL.bin FG1000AF.bin FG1000AI.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB - 30MB+/-The SimpsonsTM Kooky Carnival Redemption (Note 9)
Boot B-02 (8M) 965-BOOT-SAM 1.04 | \$7E62 U9

©Disney's Pirates of the Caribbean Pinball (POTC) (Notes 7, 9)

Boot B-02 (8M) 965-BOOT-SAM 1.06 | \$2014 U9 960-5016-00

Version 10.00AL 10.00AF 10.00AG 10.00AI

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB - 30MB+/-

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB - 30MB+/-

Family Guy™ Pinball (FG) (Notes 7, 9)

Boot B-02 (8M) 965-BOOT-SAM 2.09 | \$10A3 U9

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 5.5MB +/-

 Memory Stick 128MB (970-0128-00)
 Version

 English Only
 1.05

 English New Jersey Only
 0.09NJ

Memory Stick 128MB (970-0128-00) English + Spanish English + French German + French English + Italian

Memory Stick 128MB (970-0128-00)
English + Spanish
English + French
English + German
English + Italian

Boot B-02 (8		OOT-SAM 2		960-5016	
Er Ge	28MB (970-01 nglish + Spanis nglish + French erman+French nglish + Italian	sh [*] 1.31 1 1.31	EF 1.27 GF 1.27	+ spd_1_30 + spd_1_30 + spd_1_30	: _es.bin ef.bin
NOTE: THE TY	PICAL SIZE	PER UNZIPPE	D BIN FILE IS 251	MB - 30MB+/-	

 Spider-Man™ Pinball (S-M) (Notes 7, 9)

 Boot B-02 (8M)
 965-B00T-SAM 2.10 | \$F625 U9

footnotes:

ROMs on CPU/Sound Bd.: 520-5136-**00** (Stereo) & Display Cont. Bd.: 520-5055-01 ROMs on CPU/Sound Bd.: 520-5136-**10** (Mono) & Display Cont. Bd.: 520-5055-01 ROMs on CPU/Sound Board: 520-5136-**15** (Mono) (*FCC 11-97) & Display Controller Board: 520-5055-**02*** (*FCC 11-97)





Pinball Game Firmware Table

EDDOM	Chip	Program	USA	Bd.	inball Game F		Chip	Program	USA Von	Bd.	Raw Don't No
EPROM Laser War CPU Sound (Old) Sound (Old) Sound (Old)	(256K) (256K) (256K) (256K)	965-0004-00 965-0005-00 965-0006-00 965-0007-00	Ver. LWAR.C5	C5 J5 J6 J7	Part № 960-5007-00 960-5007-00 960-5007-00 960-5007-00	EPROM Lethal Wea CPU Voice 1 Voice 2 Sound	9ize apon 3 (512K) (2M) (2M) (256K)	965-0082-00 965-0083-00 965-0084-00 965-0085-00 965-0086-00 965-0087-00 n Display PCB 55	Ver. A2.08	C5 U17 U21 U7	960-7001-02 960-5010-00 960-5010-00 960-5007-00 960-5010-00 960-5010-00
Sound 1 Sound 2	(256K) (512K) (512K)	965-0008-00 965-0009-00 965-0010-00	- OR -	7F 6F 4F	960-5007-00 960-7001-02 960-7001-02	Display Display Display		965-0086-00 965-0087-00 n Display PCB 5: 965-0087-04 n Display PCB 5:	-OR-	ROM 0 ROM 1	960-5010-00 960-5010-00 960-5015-00
CPU CPU Voice 1 Voice 2 Sound	(256K) (256K) (512K) (512K) (512K) (256K)	965-0011-00 965-0012-00 965-0014-00 965-0015-00 965-0013-00	A4-6 A4-6	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Star Wars CPU Voice 0 Voice 1 Sound	(512K) (4M)	965-0119-00 965-0132-00	A1.03	C5 U17 U21 U7	960-7001-02 960-5015-00 960-5010-00 960-5007-00
CPU CPU Voice 1 Voice 2 Sound	(256K) (256K) (512K) (512K) (512K) (256K)	965-0016-00 965-0017-00 965-0019-00 965-0020-00 965-0018-00	A2-1 A2-1	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Display Display Display	(4M)	965-0131-00 965-0131-00 965-0120-00 965-0121-00 n Display PCB 5: 965-0122-00 n Display PCB 5:	-OR- A1.05	ROM 0 ROM 1	960-5007-00 960-5010-00 960-5010-00
Time Mach CPU CPU Voice 1 Voice 2 Sound		965-0021-00 965-0022-00 965-0024-00 965-0025-00 965-0023-00	A2-4 A2-4	B5 C5 6F 4F 7F	960-5006-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Rocky & B CPU Voice 0 Voice 1 Sound Display	ullwink (512K) (4M) (2M) (256K) (4M)	le & Friends 965-0138-00 965-0139-00 965-0140-00 965-0141-00 965-0142-00	A1.30	C5 U17 U21 U7 ROM 0	960-7001-02 960-5015-00 960-5010-00 960-5007-00 960-5015-00
Playboy 35 CPU CPU Voice 1 Voice 2 Sound	th Ann (256K) (256K) (512K) (512K) (256K)	965-0046-00 965-0047-00 965-0049-00 965-0050-00 965-0048-00	A2-4 A2-4	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Jurassic P CPU Voice 0 Voice 1 Sound Display	(512K) (4M) (2M) (256K) (4M)	965-0143-00 965-0144-00 965-0145-00 965-0146-00 965-0147-00	A5.13 A5.10	C5 U17 U21 U7 ROM 0	960-7001-02 960-5015-00 960-5010-00 960-5007-00 960-5015-00
ABC Mond CPU CPU Voice 1 Voice 2 Sound	ay Nigh (128K) (256K) (512K) (512K) (256K)	965-0031-00 965-0032-00 965-0034-00 965-0035-00 965-0033-00	A2-7 A2-7	B5 C5 6F 4F 7F	960-5006-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	CPU Voice 0 Voice 1 Sound Display	(512K) (4M) (2M) (256K) (4M)	965-0148-00 965-0149-00 965-0150-00 965-0151-00 965-0152-00	A1.12 A1.06	C5 U17 U21 U7 ROM 0	960-7001-02 960-5015-00 960-5010-00 960-5007-00 960-5015-00
Robocop CPU CPU Voice 1 Voice 2 Sound	(256K) (256K) (512K) (512K) (256K)	965-0036-00 965-0037-00 965-0039-00 965-0040-00 965-0038-00	A3-4 A3-4	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Tales from CPU Voice 0 Voice 1 Sound Display	(512K) (4M) (2M) (256K) (4M)	965-0157-00 965-0158-00 965-0159-00 965-0160-00 965-0161-00	A3.03 A3.01	C5 U17 U21 U7 ROM 0	960-7001-02 960-5015-00 960-5010-00 960-5007-00 960-5015-00
Phantom o CPU CPU Voice 1 Voice 2 Sound	f the O (128K) (256K) (512K) (512K) (512K) (256K)	pera 965-0026-00 965-0027-00 965-0029-00 965-0030-00 965-0028-00	A3-2 A3-2	B5 C5 6F 4F 7F	960-5006-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	The Who's CPU Voice 1 Voice 2 Voice 3 Voice 4 Sound	(512K) (4M) (4M) (4M) (4M) (4M) (512K) (4M)	965-0162-00 965-0165-00 965-0166-00 965-0167-00 965-0168-00 965-0164-00	A4.00	C5 U17 U21 U36 U37 U7	960-7001-02 960-5015-00 960-5015-00 960-5015-00 960-5015-00 960-7001-02 960-5015-00
CPU CPU Voice 1 Voice 2 Sound	(256K) (256K) (256K) (512K) (512K) (256K)	965-0041-00 965-0042-00 965-0044-00 965-0045-00 965-0043-00	A2-0 A2-0	B5 C5 6F 4F 7F	960-5007-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Display WWF Roya CPU Voice 1 Voice 2 Voice 3	(512K) (4M) (4M)	965-0169-00 965-0172-00 965-0173-00	A4.00 A1.06	C5 U17 U21 U36	960-5015-00 960-7001-02 960-5015-00 960-5015-00 960-7001-02 960-5015-00
The Simps CPU CPU Voice 1 Voice 2 Sound	(128K) (256K) (512K) (512K) (512K) (256K)	965-0051-00 965-0052-00 965-0054-00 965-0055-00 965-0053-00	A2-7 A2-7	B5 C5 6F 4F 7F	960-5006-00 960-5007-00 960-7001-02 960-7001-02 960-5007-00	Guns N' Re	(4M) (512K) (4M) OSES (512K) (4M) (4M)	965-0174-00 965-0171-00 965-0170-00 965-0175-00 965-0178-00 965-0179-00	A1.02	U36 U7 ROM 0	960-7001-02 960-5015-00 960-7001-02 960-5015-00 960-5015-00
Checkpoin CPU CPU Voice 1 Voice 2 Sound	(128K) (256K) (1M) (1M) (256K) (512K)	965-0056-00 965-0134-00 965-0057-00 965-0058-00 965-0059-00 965-0060-00	A1-7 A1-7	B5 C5 F7 F5 F4	960-5006-00 960-5007-00 960-5009-00 960-5009-00 960-5007-00	Voice 2 Voice 3 Voice 4 Sound Display	(4M) (4M) (512K) (4M)	965-0180-00 965-0181-00 965-0177-00 965-0176-00	A3.00	U36 U37 U7 ROM 0	960-5015-00 960-5015-00 960-7001-02 960-5015-00
CPU CPU Voice 1 Voice 2		965-0060-00 linja Turtles 965-0061-00 965-0063-00 965-0064-00 965-0065-00	CP80 A1.04 A1.04	U8 B5 C5 F5/6 F4/5 F7	960-7001-02 960-5006-00 960-5009-00 960-5009-00 960-5007-00 960-7001-02	CPU Voice 1 Voice 2 Voice 3 Sound Display* Display*	(512K) (4M) (4M) (4M) (512K) (4M) (4M)	965-0182-00 965-0186-00 965-0187-00 965-0187-01 965-0183-00 965-0183-00 965-0184-00	A4.01 A4.01 A4.01	C5 U17 U21 U36 U7 ROM 0 ROM 3	960-7001-02 960-5015-00 960-5015-00 960-5015-00 960-7001-02 960-5015-00 960-5015-00
Sound Display Batman CPU CPU Voice 1 Voice 2	(128K) (256K) (2M)	965-0066-00 965-0067-00 965-0135-00 965-0068-00	A1.06 A1.06	B5 C5 U17	960-5006-00 960-5007-00	Mary Shell CPU Voice 1 Voice 2 Voice 3 Sound Display* Display*	ey's Fra (512K) (4M) (4M) (4M) (512K) (4M) (4M)	965-0188-00 965-0192-00 965-0193-00 965-0193-00 965-0191-00 965-0189-00 965-0190-00	* A1.03 A1.03 A1.03 A1.03	C5 U17 U21 U36 U7 ROM 0 ROM 3	960-7001-02 960-5015-00 960-5015-00 960-5015-00 960-7001-02 960-5015-00 960-5015-00
Sound Display Star Trek 2 CPU Voice 1 Voice 2	(256K) (1M)	965-0072-00 965-0073-00 965-0074-00	A1.06 A2.01	U21 U7 U8 C5 U17 U21	960-5009-00 960-5007-00 960-5009-00 960-7001-02 960-5010-00 960-5010-00	Baywatch CPU Voice 1 Voice 2 Sound	* (512K) (4M) (4M) (512K)		Board 520-50 A4.00	003-04) C5 U17 U21 U7	960-7001-02 960-5015-00 960-5015-00 960-7001-02 960-5015-00 960-5015-00
Sound Display Hook CPU Voice 1 Voice 2 Sound	(512K) (2M) (2M) (2M) (256K) (1M)	965-0075-00 965-0076-00 965-0078-00 965-0078-00 965-0079-00 965-0080-00	A1.09 A4.08	C5 U17 U21 U7	960-5007-00 960-5009-00 960-5010-00 960-5010-00 960-5010-00 960-5007-00 960-5009-00	Display* Display* Batman For CPU Voice 1 Voice 2 Sound	(512K) (4M) (4M) (512K)	(CPU 965-0202-00 965-0203-00 965-0204-00 965-0205-00	A4.00 A4.00 Board 520-50 A3.02	C5 U17 U21 U7	960-7001-02 960-5015-00 960-5015-00 960-7001-02
Display	(1M)	965-0081-00	A4.01	U8	960-5009-00	Display* Display*	(4M) (4M)	965-0206-00 965-0207-00	A3.00 A3.00	ROM 0 ROM 3	960-5015-00 960-5015-00

* Note: Display EPROMS (4M) for Maverick thru Batman Forever require an access time of 120 Nsec or faster.



APPENDIX B

Semi-Conductors / Integrated Circuits (I.C.) / Relays Cross-Reference Table

Table Nº	Туре	Source Number	STERN® PINBALL	N T E®	E C G®	Radio Shack®	R C A®
,	RECTIFICATION	N, BLOCKING, DA	MPENING DIODE	9 AND/OR LI	GHT EMITTIN	IG DIODES (I	LEDs)
	Diode	1N4001	112-5001-00	NTE552	ECG552		SK9000
	Diode	1N4004	112-5003-00	NTE116	ECG116	276-1103	SK3312
	Diode	1N5401	112-0056-00	NTE5801	ECG5801	276-1143	SK9004
_	Diode	1N5404	112-5004-00	NTE5804	ECG5804	276-1144	SK9007
	Diode	T6A10L	112-5006-01	NTE5812	ECG5812		
•	Diode	FR302	112-5009-00	NTE588	ECG588		SK5014
	Diode, Signal	1N914	112-5014-00				
	LED	MT5000UR or TLRH180P	165-5052-00 (old SPI Part №:			276-066B	
		(T1-3/4 GaAIAs)	165-5100-00)				
	ZENER DIODES	3					
	Diode	1N4742A 12v	112-0061-00	NTE142A	ECG142A	276-563	SK12V
	Diode	1N4760B 68v	112-0062-00B	NTE5092A	ECG5092A		SK68V
	Diode	1N4764A 100v	112-0049-00A	NTE5096A	ECG5096A		SK100V
	Diode	1N5228 3.9v	112-0053-00	NTE5007A	ECG5007A		SK3A9
2	Diode	1N5234B 6.2v	112-0047-00B	NTE5013A	ECG5013A	276-561	SK6A2
	Diode	1N5379 110v	112-0072-00	NTE5157	ECG5157	- — - — -	SK110X
	Diode	1N6267A 6.8v	112-5011-00	NTE4902	ECG4902	- — - — -	
	Diode	1N4752A 33v	112-5010-00A	NTE147A	ECG147A		SK33V
	Diode	1N4736 6.8v 1w	112-5007-00	NTE5071A	ECG5071A		
	TRANSISTORS	- TYPE FET, NPN	, PNP AND/OR 9	CR			
	FET Trans.	STP20N10L	110-0106-00	NTE2987	ECG2987		
	FET Trans.	STP19N06L	110-0088-00	NTE2985	ECG2985		
	FET Trans.	VN02N	110-0089-00				
	NPN Trans.	2N4401	110-0073-00	NTE85	ECG85	276-2009	SK3124A
	NPN Trans.	2N6427	110-0070-00	NTE48	ECG48		SK4906
	NPN Trans.	MJE340	110-0071-00	NTE157	ECG157		SK3747
	NPN Trans.	MPSA42	110-0082-00	NTE287	ECG287		SK3232
	NPN Trans.	2N3904	110-0069-00	NTE123AP	ECG123AP	276-2009	
3	NPN Trans.	TIP122	110-0067-00	NTE261	ECG261	276-2068	SK3896
	NPN Trans.	MJE15030	110-0101-00	NTE375	ECG375		SK9118
	PNP Trans.	2N5401	110-0078-00	NTE288	ECG288		SK3434
	PNP Trans.	MJE15031	110-0103-00	NTE292	ECG292		SK3441
	PNP Trans.	MJE350	110-0072-00	NTE374	ECG374		SK9042
	PNP Trans.	MPSA92	110-0100-00	NTE288	ECG278		SK3434
	PNP Trans.	TIP42	110-0068-00	NTE332	ECG332		SK9236
	PNP Trans.	TIP32C	110-0081-00	NTE292	ECG292		SK3441
	PNP Trans.	TIP36C	110-0077-00	NTE393	ECG393		SK3961
	SCR Trans.	2N5060	110-0074-00	NTE5400	ECG5400	276-1067	SK3950
	SCR Trans. BRIDGE RECTI	SCR2800B	110-0083-00	NTE5461-8	•	•	<u> </u>
	BRIDGE RECII				Comr	nents:	
4	BR (Present)	DB3501 or CM3501	112-5000-00	For White Sta	rl/O Bds., BR	a = 35 Amp @	100v P.I.V.
	RELAYS					nents:	
	Relay	FRL-264 D024/02CK	190-5002-00	Relay = 24v	DC 10 Amp	& White Star DPDT	I/O Boards,
5	Relay	FRL-264 D006/04CV	190-5001-00	For CPU Bo Relay = 6v [ards, DC 5 Amp 4 F	Pole DT	



APPENDIX C



Production Start Date, Manual Part №, ROM Size & Positions and Jumper W6 Installed Note‡ (White Star Board System & S.A.M. System Only*)

_	ame Name White Star	Production Start Date	CPU/So	ound Board	Game U2	210 1MB	Mote)
	l. System™	and Manual Part Nr.	U17	ound Boa U21	U36	U37	Jump Instal (‡ see !)
* N	through betweei or on-lir	nplete Apper Batman Fo n Apollo 13 ne at our web ailable on CE	<mark>rever</mark> , so through osite ww	ee any S <mark>Ripley's</mark> w.sternp	Service C Believ Sinball.co	Game Ma e It or N om/parts:	anual <mark>ot!</mark> htm;
	Pinball	ailable on CI <mark>Party, T3</mark> ®	and The	Lord of	f the Rin	gs TM).	
29	Apollo 13 (A13)	NOV 95 780-5044-00	4MB	4MB	4MB	Not Used	n/a
30	Golden Eye	FEB 96 780-5042-00	4MB	4MB	Not Used	Not Used	n/a
31	Twister	APR 96 780-5041-00	4MB	4MB	Not Used	Not Used	n/a
32	ID4: Independence Day	JUL 96 780-5045-00	4MB	4MB	Not Used	Not Used	n/a
33	Space Jam	OCT 96 780-5043-00	4MB	4MB	4MB	Not Used	n/a
34	The Star Wars Trilogy - Sp. Ed.	FEB 97 780-5056-00	4MB	4MB	Not Used	Not Used	n/a
35	The Lost World: Jurassic Park	JUN 97 780-5053-00	4MB	4MB	Not Used	Not Used	n/a
36	The X-Files	AUG 97 780-5046-00	4MB	4MB	Not Used	Not Used	n/a
37	Starship Troopers	NOV 97 780-5059-00	4MB	4MB	4MB	Not Used	n/a
38	Viper Night Drivin'	FEB 98 780-5035-00	4MB	4MB	4MB	4MB	n/a
39	Lost In Space	JUN 98 780-5060-00	4MB	4MB	4MB	4MB	n/a
40	Godzilla	SEP 98 780-5040-00	4MB	4MB	4MB	4MB	n/a
41	South Park	JAN 99 780-5071-00	8MB	8MB	8MB	8MB	W6
42 a	Harley- Davidson®	AUG 99 780-5067-01	8MB	8MB	8MB	8MB	W6
42 b	Harley-David- son®2nd Ed.	SEP 02 780-5067-10	8MB	8MB	8MB	8MB	W6
42 c	Harley-David- son® 3rd Ed.	OCT 04 780-5087-00	8MB	8MB	8MB	8MB	W6
43 a	Striker Xtreme	MAR 00 780-5068-01	8MB	8MB	8MB	8MB	W6
43 b	NFL	OCT 00 780-50 73 -00	8MB	8MB	8MB	8MB	W6
44	Sharkey's Shootout	JUL/OCT 00 780-5072-01	8MB	8MB	8MB	Not Used	W6
45	High Roller Casino	JAN 01 780-5065-00	8MB	8MB	8MB	8MB	W6
46	Austin Powers™	MAY 01 780-5074-00	8MB	8MB	8MB	8MB	W6
47	MONOPOLY®	SEP 01 780-5075-00	8MB	8MB	8MB	Not Used	W6
48	Playboy	FEB 02 780-5076-00	8MB	8MB	8MB	8MB	W6
49	RollerCoaster Tycoon™	AUG 02 780-5078-00	8MB	8MB	8MB	Not Used	W6
50	The Simpsons™ Pinball Party	JAN 03 780-5077-00	8MB	8MB	8MB	8MB	W6
51	T3®: Rise of the Machines™	MAY 03 780-5079-00	8MB	8MB	8MB	8MB	W6
52	The Lord of the Rings™	NOV 03 780-5080-00	8MB	8MB	8MB	8MB	
53	Ripley's Believe It or Not!®	APR 04 780-5081-00	8MB	8MB	8MB	8MB	

Game Name White Star Board System TM		Production Start Date and Manual	CPU/Sound Board Sound U7 512K CPU/Sound Board Game U210 1MB CPU/Sound Board Voice ROMS:					
		Part Nr.	U17	U21	U36	U37		
54	Elvis®	AUG 04 780-5084-00	8MB	8MB	8MB	8MB		
55	The Sopranos ^{sм}	FEB 05 780-5085-00	8MB	8MB	8MB	8MB		
56	NASCAR®	JUL 05 780-5086-00	8MB	8MB	8MB	8MB		
57	Grand Prix	SEP 05 780-5091-00	8MB	8MB	8MB	8MB		

See Apdx. A for more detailed information on Pinball Game Firmware (ROM Name, Size, Part Numbers, USA Version & Checksum and Board Locations).

	Game Name	Production Start Date	S.A.M.	S.A.M. System CPU/Sound Board Boot EPROM U9					
	S.A.M. System	and Manual Part Nr.	965-BOOT-SAM (Programmed)						
58	World Poker Tour TM (WPT)	JUN 06 780-5088-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			
59	The Simpsons™ Kooky Carnival	APR 06 780-5090-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			
60	©Disney's Pirates of the Caribbean	AUG 06 780-5092-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			
61	Famil Guy™	DEC 06 780-5093-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			
62	Spider-Man TM	MAY 07 780-5094-00	8MB	B-02 V2.1+	chksum \$F625	LOC: U9			

Games 58 – current, S.A.M. System : CPU/Sound & I/O Power Driver PCBs differ than White Star ($previous\ Games\ 29-57$); Disp. Controller Not Required.

See **Apdx.** A for more detailed information on **Pinball Game Firmware** (ROM Name, Size, Part Numbers, USA Version & Checksum and Board Locations).



[‡] Additional Information for **Installed** Jumper (above games 41-51):

[•] Installed **W6** so 8MB ROMS can be utilized. See the **CPU/Sound Board Schematic** (Sheet 2 of 3, Address Location 3E) in the games' Service Game Manual. Games 52 - 57 CPU/Sound Board differ than <51 (See Appendix D).



APPENDIX D Board Type (White Star Board System* Only) Table



Game Name	Flipper	I/O Power Driver	CPU/Sound Stereo	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application
	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
Apollo 13	Miscellaneous	Light Board	ds 520-5130-01, Display & Light B	-04 & -05 Magne d. 520-5130-06 N	et Interface.	Relay Board 520-5010-00	Olligic Of TO	Olligic Of TO	OVER OF RICKER
	PC Boards: 520-5080-00	Board 520-5	130-02 Switch M	lembrane Board	<u>520-5130-03</u>		520-5124-00	520-5125-00	5-Ball Trough
Golden Eye	2-Flipper Miscellaneous	520-5137-00	520-5136-00 Boards	520-5138-00 Mag Processo	520-5052-00 128 X 32 Dots or X2 Driver Bd.	520-5055-01 Relay Board	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
GAMES HER	PC Boards:	520-5128-0	5 through -08	520-5 ⁻	143-00	520-5010-00	TM		
Game	I/O Power	CPU/Sound	Disp. Power	Dot Matrix	Display	ОРТО	ОРТО	ОРТО	Misc OPTO
Name	Driver 520-5137-01	Mono 520-5136-10	Supply 520-5138-00	Display 520-5052-00 128 X 32 Dots	Confroller 520-5055-01	Transmitter 520-5124-00 Single OPTO	Receiver 520-5125-00	Application 5-Ball Trough	& Арр.
Twister	Miscellaneous	Light I	Boards	Mag. Drv. Bd.	Relay Board 520-5010-00	Single OPTO	Single OPTO	over Up-Kicker	
	PC Boards: 520-5137-01	520-5145-0° 520-5136-10	through -07 520-5138-00	520-5143-00 520-5052-00 128 X 32 Dots	520-5010-00 520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough	
Independence Day (ID4)	Miscellaneous	Light E	Boards	Servo Mtr. Bd.	320-3033-01	520-5082-00	520-5083-00	over Up-Kicker Alien Head	
	PC Boards: 520-5137-01	520-5149-0° 520-5136-10	through -10 520-5138-00	520-5152-00 520-5052-00 128 X 32 Dots	520-5055-01	Long Hop орто 520-5124-00 Single OPTO	Long Hop орто 520-5125-00	Enter 5-Ball Trough	
Space Jam	Miscellaneous PC Boards:	2X 7-Segment	Display Board	128 X 32 Dots	320-3033-01	Single OPTO	Single OPTO	over Up-Kicker	
The Star	520-5137-01	520-5 520-5136-10	153-00 520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough	
Wars Trilolgy - Special Ed.	Miscellaneous	Relay Board	020 0.00 00	128 X 32 Dots	020 0000 01	Single OPTO	Single OPTO	over Up-Kicker	
	PC Boards: 520-5137-01	520-5010-00 520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single ODTO	520-5125-00 Single OPTO	4-Ball Trough	520-5162-00
The Lost World: J.P.	MiscellaneousF C Boards:	DC Relay Bd.	Shaker Mtr. Bd.	128 X 32 DOIS		Single OPTO	Single OPTO	over Up-Kicker	2-Pos. Motor Sensor on Snagger Motor
	520-5137-01	520-5066-00 520-5136-10	520-5065-00 520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	520-5155-00 3-Pos. Motor
The X-Files	Miscellaneous PC Boards:			120 X 32 D0l5		520-5082-00	520-5083-00	File Cabinet	Sensor on File Cab.
	520-5137-01	520-5136-15	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-02	Long Hop opto 520-5124-00 Single OPTO	Long Hop орто 520-5125-00 Single OPTO	Enter 4-Ball Trough	Motor
Starship Troopers	Miscellaneous PC Boards:	4X 7-Segment	Display Board	128 X 32 Dots	320-3033-02	520-5082-00	520-5083-01	over Up-Kicker L/R Orbit	
	PC Boards: 520-5137-01	<u>520-5</u> 520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	Long Hop орто 520-5124-00 Single OPTO	Long Hop OPTO 520-5125-00 Single OPTO	Lane Enter 4-Ball Trough	
Viper Night Drivin'	Miscellaneous	Relay Board	320-3136-00	128 X 32 Dots	320-3033-03	520-5082-00	520-5083-01	over Up-Kicker Jump Ramp	
	PC Boards: 520-5137-01	520-5010-00 520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	Long Hop орто 515-0173-00	Long Hop орто 515-0174-00	4-Ball Trough	
Lost In Space	Miscellaneous PC Boards:	Relay Board	320 3100 00	128 X 32 Dots	320 3033 00	Dual OPTO	Dual OPTO	over Up-Kicker	
	520-5137-01	520-5010-00 520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00	4-Ball Trough	
Godzilla	Miscellaneous	Shaker Mtr. Bd.		128 X 32 DOIS		Dual OPTO	Dual OPTO	over Up-Kicker	
	PC Boards: 520-5137-01	520-5065-00 520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	5-Ball Trough	
South Park	Miscellaneous PC Boards:			120 X 32 D0l5		520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Kenny Under Trough Enter	
Harley- Davidson®	520-5137-01	520-5136-16 *520-5300-00*	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
1st-3rd* Editions	Miscellaneous PC Boards:	Relay Board 520-5010-00	Shaker Mtr. Bd. 520-5065-00	Diode Board 520-5146-00		520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Motorcycle Enter	
Striker Xtreme	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5155-00 3-Pos. Motor
Xtreme (NFL)	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Relay Board 520-5010-00	Diode Board 520-5146-00	for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Goalie Under- Trough Enter	Sensor on Goalie Motor
Sharkev's	520-5137-64	520-5136-64	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5194-00 4-Pos. Motor
Sharkey's Shootout	MiscellaneousF C Boards:	Relay Board 520-5010-00	Sol. Exp. Bd. 520-5192-00					·	Sensor on ?-Ball Motor
	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5194-00 4-Pos. Motor
High Roller Casino						520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Ball Lock under Roulette	Sensor on Roulette
	Miscellaneous PC Boards:	Dot Display (5X 520-5	(7) in Slot Mach. 197-00		for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5196-00 3-Pos. OPTO	520-5195-00 3-Pos. OPTO	Up/Dn Ramp in Slot Mach.	Wheel Motor
Austin	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5212-00
Powers TM	MiscellaneousF C Boards:	Relay Bd. (X3) 520-5010-00			for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5082-00 Long Hop орто	520-5083-01 Long Hop орто	Time Machine Ramp	Pulse-Stretcher OPTO on Spini-Me
MONORCHI	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
MONOPOLY®	MiscellaneousF C Boards:	DC Relay Bd. 520-5066-00		lay (3 by 5X7) (Electric C° Sign)	for UK ONLY> Sol- enoid Expander Bd. 520-5192-00	520-5218-00 4-Pos. OPTO	520-5210-00 4-Pos. OPTO	Bank Door	
	J	020-3000-00	<u> </u>	(Electric C Sign)	320-3192-00		ble continu		vt nago







Board Type (White Star Board System* & S.A.M. System** Only) Table

Playboy	520-5222-00 1-Position Switch Detect on Wheel Spin
Playboy Miscellaneous PC Boards: S20-5066-00 S20-5010-00 S20-5010-00 S20-5010-00 S20-5010-00 S20-5010-00 S20-5010-00 S20-5010-00 S20-5010-00 S20-5010-00 S20-50100-00 S20-	1-Position Switch Detect
Tycoon Miscellaneous PC Boards: DC Relay Bd. 520-5066-00 520-5066-00 520-5066-00 520-50221-00 (Ramp Enter Sign) 520-5192-00 520-5192-00 520-5192-00 520-5192-00 520-5192-00 520-5192-00 520-5192-00 520-5192-00 520-5192-00 520-5192-00 520-5192-00 520-5055-03	1-Position Switch Detect
Tycoon™ Miscellaneous PC Boards: DC Relay Bd. 520-5066-00 520-5221-00 (Ramp Enter Sign) for UK ONLY's Soleniol Expander Bd. 520-5082-00 Long Hop opro Long	Switch Detect
The Simpsons™ Pinball Party 520-5137-01 520-5136-16 520-5138-00 520-5035-00 520-5055-03 515-0173-00 515-0174-00 4-Ball Trough Over Up-Kicker 520-5138-00 520-5219-00 520-5225-00 71 September 520-508-01 520-508-0	
Pinball Miscellaneous LED Bd. Color Dot Display (4 by 5X7) Party PC Boards: 520-5219-00 520-5225-00 (TV Set) for UK ONLY 4 Aux. Driver Bd. 520-5088-01	
3. 128 X 32 Dots 520-5137-01 520-5136-16 520-5136-00 128 X 32 Dots 520-5035-05 Dual OPTO Dual OPTO over Up-Kicker	
Rise of the Miscellaneous PC Boards: Miscellaneous PC Boards: Miscellaneous PC Boards: Miscellaneous PC Boards: Miscellaneous PC Boards: Single OPTO Single OPTO Trough Miscellaneous PC Boards:	
The Lord of the of the control of th	500-6746-00 (White Trans.)
of the Rings™ Miscellaneous PC Boards: 19-LED PCB OPTO Transmitter / Receiver Amplifier PCB 520-5239-00 Miscellaneous 515-7308-00 Single OPTO Single OPTO Single OPTO Trough	`500-6747-00' (Black Rec.)
Ripley's Believe It 520-5137-01 520-5300-00 520-5138-00 520-5138-00 520-5055-03 520-5055-03 515-0173-00 515-0174-0	500-6775-00 OPTO Trnscvr
Believe it or Not!® Miscellaneous 520-5236-00 OPTO Transmitter / Receiver Aux. Driver Bd. 520-5234-00 3-Pos. OPTO	520-5235-03 X3 Aux. Drvr
520-5137-01 520-5300-00 520-5138-00 520-5052-00 520-5055-03 515-0173-00 515-0174-00 over Up-Kicker	
Miscellaneous PC Boards: Miscellaneous PC Boards: Miscellaneous PC Boards: for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	
The 520-5137-01 520-5300-00 520-5138-00 520-5052-00 520-5055-03 515-0173-00 515-0174-00 definition of the control of the contr	
Sopranos SM Miscellaneous PC Boards: Miscellaneous PC Boards: for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	
NASCAR® 520-5137-01 520-5300-00 520-5138-00 520-5052-00 520-5055-03 515-0173-00 515-0174-00 d-Ball Trough over Up-Kicker	500-6775-00 OPTO Trans.
and [NDSE] Miscellaneous PC Boards: X3 Aux. Drvr Amplifier PCB 520-5239-01 OPTO Transmitter / Receiver Aux. Driver Bd. 520-568-01	(Qty. 16) Switch Detect.
Grand Prix 520-5137-01 520-5300-00 520-5138-00 520-5138-00 520-5052-00 520-5055-03 515-0173-00 515-0174-00 over Up-Kicker	500-6775-00 OPTO Trans.
Miscellaneous PC Boards: 520-5235-03 OPTO Transmitter / Receiver Aux. Driver Bd. 320-5088-01	(Qty. 16) Switch Detect.
	ansceiver aneous
World Foxer Backbox Backbox 128 X 32 Dots 4-Ball Trough 4-Ball Trough 4 Switch Pairs Jail Bars Up A	'U' 1/per PCB ce/Hole Mech
(Qty. 8) S2U-5254-00 S2U-5254-00 S2U-5252-04 S2U-5252-04 S2U-5252-04 S2U-5248-00 (Qty. 8) S2U-5252-04 Drop Targets	'U' 4/per PCB 4- & 8- Banks
The Simpsons™ Back Door Back Door Cabinet Rear 128 X 32 Dots Coin Drop	
Carnival Miscellaneous 515-5742-00 500-6700-00 (Qty. 11)	
©Disney's Pirates Selection	
Miscellaneous 520-5239-01 511-5024-03 of the Caribbean Miscellaneous 520-5239-01 511-5024-03 520-5238-00: H-E-A-R-T LED PCB 520-5238-00: H-E-A-R-T LED PCB 520-5238-00: H-E-A-R-T LED PCB	
520-5249-00 520-5246-00 520-5138-00 520-5052-00 515-0173-00 515-0174-00 3 Switch Pairs Prop Tarr	'U' 1/per PCB get 1-Bank
Guy™ Miscellaneous 520-5239-01 520-5261-00 511-5042-01 500-6775-01 500-6775-01 520-5252-04	'U' 4/per PCB get 4-Bank
Spider- Man	
Man TM Miscellaneous 520-5239-01 PCBs: OPTO Amp. (X2)	



APPENDIX D

Board Type Table

Game Name	Flipper	Sound	Power Supply	Display X-Digit		
Laser War	2-Flipper Board Not Required	initial: 520-5002-00 replaced with: 520-5002-02 520-5002-01 was not used.		Master: 520-5004-00 plus: 520-5005-00 (Qty. 2): 7 Digit Alpha/Numeric 520-5006-00 (Qty. 2): 7 Digit Numeric 520-5007-00 (Qty. 1): 4 Digit Numeric		
Secret Service Torpedo Alley	3-Flipper Board Not Required		520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined		
Time Machine	2-Flipper Board Not Required					
Playboy 35th Anniversary *	520-5033-00	520-5002-02				
ABC Monday Night Football * Robocop Phantom of the Opera Back to the Future	2-Flipper (*only for 100 games of Playboy 35th Anniv. &			520-5030-00 16 Digit Alpha/Numeric Combined		
The Simpsons	ABC Mon. Night Football)	520-5002 -03				

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Apllication	
 Checkpoint Teenage Mutant Ninja Turtles 		520-5002-03	520-5047-00	520-5042-00 128 X 16					
BatmanStar Trek25th Anniv.Hook	520-5033-00 2-Flipper	520-5050-01 520-5050-02 520-5050-03	320-3047-00						
 Lethal Weapon 3 			520-5047-01		520-5055-00				
Star WarsRocky & Bull- winkle & Friends									
Jurassic Park	520-5076-00 3-Flipper			520-5052-00 128 X 32 –					
 Last Action Hero 	520-5070-00 2-Flipper		520-5047-02						
 Tales from the Crypt 	520-5076-00				520-5055-01				
The Who's Tommy	3-Flipper								
 WWF Royal Rumble 	520-5070 / 5080 -00 4-Flipper (2X2)	520-5077-00							
 Guns N' Roses 	520-5076-00								
Maverick	3-Flipper	520-5050-03	520-5047-03	520-5075-00 192 X 64	520-5092-01	520-5102-00 Single OPTO	520-5103-00 Single OPTO	Paddle Boat Wheel Enter	
 Mary Shelley's Frankenstein 	520-5076-00 3-Flipper	520-5077-00							
Baywatch	520-5070 / 5080 -00 4-Flipper (2X2)	520-5126-02				520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker	
Batman Forever	520-5076-00 3-Flipper	320-3120-02	020-0120-02				520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker

Miscellaneous Boards (Lamp Boards & Relay Boards) not listed above can be found in each individual game manual.





Flipper Coil (White Star Board System* & S.A.M. System** Only) Table

THE STATE OF THE S

Typical Coil Diode 1N4004 unless noted otherwise (Diode Top = above lugs next to windings; Diode Below (Bottom) = under lugs opposite of windings).

SAM

	TANDARI Res (Ω)		PICAL APPLICATIONS) rt Number and Comments	LARG GaTurn			SPECIAL APPLICATIONS) rt Number and Comments
20-400	1.0 Ω	090-5021- <i>use</i> :		21-900	call Ω	090-5020- <i>use</i> :	
22-500	1.7 Ω	090-5017- <i>use</i> :		21-300	Octil SS	000 0020 000.	-10 Diode Top <brown><red></red></brown>
22-600	2.2 Ω		-0B Diode Below // -0T Diode Top	22-750 /	2.6 Ω 92.0 Ω	090-5011- <i>use</i> :	-00 DUAL WND COIL // 3-Lugs Diode x2
23-700	3.1 Ω		-0B Diode Below // -0T Diode Top	30-2600	92.0 Ω		
23-750	3.4 Ω	090-5019- <i>use</i> :		22-900	3.45 Ω	090-5020-use:	
23-800	3.6 Ω		-0B Diode Below // -0T Diode Top //		T		-20-ND No Diode
			-NL No Lugs 11" Leads // -ND No Diode	22-1080	4.2 Ω	090-5032- <i>use</i> :	-0B D. Below // -0T D. Top <yel-grn></yel-grn>
23-840	4.0 Ω	090-5005- <i>use</i> :		00 000 /	04.0	000 5000	
23.5-765	3.6 Ω	090-5037- <i>use</i> :		23-620 / 30-2600	2.4 Ω 75.0 Ω	090-5006- <i>use</i> :	-00 DUAL WND COIL // 3-Lugs Diode X2
24-900	5.0 Ω		-02 Diode Top // -10 No Lugs 14" Leads			000 5010	-00 DUAL WOUND COIL // Diode Top
24-940	5.5 Ω	090-5036- <i>use</i> :	-0B Diode Below // -0T Diode Top use 090-5051-01 No Lugs 11" Leads	23-700 / 30-2600	3.0 Ω 83.5 Ω		
25-1240	9.3 Ω	090-5034- <i>use</i> :	-00 Diode Below	23-800 /	2.4 Ω 90.5 Ω	090-5012- <i>use</i> :	-00 DUAL WOUND COIL // Diode Top
26-1200	10.3 Ω		-0B Diode Below // -0T Diode Top //	30-2600	90.5 \(\Omega\)2		
			-NL No Lugs 11" Leads // -ND No Diode	23-900	4.05 Ω	090-5020- <i>use</i> :	-30 Diode Top <green></green>
27-1300	14.2 Ω	090-5003- <i>use</i> :		23-1100	5.1 Ω	090-5030- <i>use</i> :	-0T Diode Top <orange> I -ND No Diode</orange>
27-1400	14.7 Ω	090-5015- <i>use</i> :	-00 Diode Below	00.4000	74.0	000 5000	
27-1400			Special App.: No Diode / Lugs + Conn.	23-1200		090-5008- <i>use</i> :	
27-1500			-0B Diode Below // -0T Diode Top	23-1500	4.4 Ω		-00 Diode Top <blue> -00 Diode Top <blue></blue></blue>
29-2000		090-5016- <i>use</i> :		24-1570	9.5 Ω	090-5025- <i>use</i> :	
LARGE,			(MAGNET APPLICATIONS)	25-1400	$call \Omega$		-0T Diode Top <red> -0T Diode Top <white></white></red>
20.5-480	2.9 Ω		-02 No Lugs <i>or</i> Core; 14" Leads // Large	25-1600	V 0.11		
22-650	4.3 Ω	090-5042- <i>use</i> :	-00 No Lugs <i>or</i> Core; 6" Leads // Large - 01 No Lugs <i>or</i> Core; 12" Leads // Large	25-1800		090-5041- <i>use</i> : S (RESET / T	TRIP APPLICATIONS
24-780	8.0 Ω	090-5061- <i>use</i> :	-00 No Lugs or Core; 6" Lds. // Medium	27-950		090-5046- <i>use</i> :	
29-1000	15.2 Ω	090-5059- <i>use</i> :	-00 Lugs + Diode + Magnet Core // Mini	28-1050	11.5 Ω	090-5046- <i>use</i> :	-00 Diode Top
31-1500	52.0 Ω		Straight Lugs + Diode + Mag Core // Mini	27-880	call Ω	500-6976-01	No Lugs <i>or</i> Diode + 6" Leads & Conn.
			90° Lugs + Diode + Magnet Core // Mini	31-590	call Ω	090-5010-use:	
			.03 depending on meter calibration.	32-1250	35.0 Ω		includes Flap & Screw <yellow></yellow>
EXISTS, ensu	re it is the co	rrect sleeve for th	ome with Coil Sleeves. IF A SLEEVE are application usage. For the correct Coil g the coil exists on and order separately.	32-1800	50.2 Ω	090-5031- <i>use</i> : (515-6110-00)	-0B Diode Below // -0T Diode Top use 515-# to include mounting & armature brackets
Sieeve, reier to	o ule Gaille /	noociiibiy DidWili	y ine con exists on and order separately.	33-1590	59.0 Ω	515-6916-00 :	includes brackets <white></white>

Flipper Coil (White Star Board System* Only) Table

GAME NAME	Nº of	FLIPP SPINº/GAUGE	ERS -TURNS / Color	FLIPPERS no E.O.S. Switch SPI № / GAUGE-TURNS / Color		
	Flippers	LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT	
* Note: For complete Appendix Information Ripley's Believe It or Not!; or	ation for Gar order CD-R	nes Laser War through Bat	man Forever, see any Servers™ Pinball Party, Termin	rice Game Manual between A lator® 3 and The Lord of th	Apollo 13 through e Rings™).	
Apollo 13	2	090-5032-0T 22-1080 -YEL-GRN -	SAME	Not Used	Not Used	
Golden Eye	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
Twister	2	090-5020-20T 22-900 -YELLOW-	090-5032-0T 22-1080 -YEL-GRN-	Not Used	Not Used	
ID4: Independence Day	3	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	090-5020-30 23-900 -GREEN-	
Space Jam †	2	090-5032-0T 22-1080 -YEL-GRN-	090-5020-20T 22-900 -YELLOW-	Not Used	Not Used	
The Star Wars Trilogy - Special Edition †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
The Lost World: Jurassic Park †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
The X-Files †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
Starship Troopers †	3	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	090-5032-0T 22-1080 -YEL-GRN-	
Viper Night Drivin' †	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used	
Lost In Space †	2	090-5030-0T 23-1100 -ORANGE-	090-5032-0T 22-1080 -YEL-GRN-	Not Used	Not Used	
Godzilla †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used	
South Park †	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used	

Coil Part Numbers ending with a "T" signifies the Diode is on the top of the lug (on the coil-winding side);
 Coil Part Numbers ending with a "B" signifies the Diode is on the bottom of the lugs.

Table continued on the next page.







Flipper Coil (White Star Board System* & S.A.M. System** Only) Table



	NIO of	FLIPPERS w/E	.O.S. Switch	FLIPPERS no	E.O.S. Switch
GAME NAME	Nº of Flippers	SPI Nº / GAUGE	-TURNS / Color	SPI № / GAUGE	-TURNS / Color
	i lippers	LOWER LEFT LOWER RIGHT		UPPER LEFT	UPPER RIGHT
Harley-Davidson® † and 1st through 3rd Editions	2	090-5032-0T 22-1080 -YEL-GRN-	090-5030-0T 23-1100 -ORANGE-	Not Used	Not Used
Striker Xtreme (NFL) †	3	090-5032-0T 22-1080 -YEL-GRN-	090-5030-0T 23-1100 -ORANGE-	090-5030-0T 23-1100 -ORANGE-	Not Used
Sharkey's Shootout †	3	090-5030-0T 23-1100 -ORANGE-	SAME	090-5030-0T 23-1100 -ORANGE-	Not Used
High Roller Casino †	2	090-5020-20T 22-900 -YELLOW-	090-5032-0T 22-1080 -YEL-GRN-	Not Used	Not Used
Austin Powers TM †	2	090-5020-30 23-900 -GREEN-	090-5030-0T 23-1100 -ORANGE-	Not Used	Not Used
MONOPOLY®†	3	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	090-5062-0T 23-1500 -BLUE-
Playboy †	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used
RollerCoaster Tycoon TM †	4	090-5032-0T 22-1080 -YEL-GRN-	SAME	090-5067-0T 25-1400 -RED-	090-5068-0T 25-1600 -WHITE-
The Olympia and TM	6**	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	090-5030-0T 23-1100 -ORANGE-
The Simpsons™ Pinball Party †	(5 with Flipper	** The Homer Head As	sembly is affixed to an	Flippers (Mini-Bats) o	on 2nd Level Playfield:
T IIIDAII T AITY	Bats)	Upr. Rt. Style Flipper (no E.O.S. Switch):	** 090-5020-20T 22-900 -YELLOW-	090-5041-00T 25-1800 -BLU-GRN-	090-5025-00 24-1570 -BLUE-
Terminator® 3: Rise of the Machines™ †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
The Lord of the Rings™ †	2	090-5020-20T 22-900 -YELLOW-	SAME	Not Used	Not Used
Ripley's Believe It or Not!® †	3	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	090-5067-00T 25-1400 -RED-
Elvis®†	4	090-5020-20T 22-900 -YELLOW-	SAME	090-5020-30 23-900 -GREEN-	SAME
The Sopranos ^{sм} †	2	090-5032-0T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
NASCAR® and [NDSE] †	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used
Grand Prix † † Coil Part Numbers ending with a "T" sign	2	090-5030-0T 23-1100 -ORANGE-	SAME	Not Used	Not Used

** S.A.M. System Games **DO NOT REQUIRE DIODES**. If you use a coil from your stock which has a diode, remove it **ONLY FOR** S.A.M. System Games.

World Poker Tour™ (WPT)**	4	090-5032-ND 22-1080 [NO DIODE]	SAME	090-5030-ND 23-1100 [NO DIODE]	SAME
©Disney's Pirates of the Caribbean**	2	090-5030-ND 23-1100 [NO DIODE]	SAME	Not Used	Not Used
Family	3 Norm.	090-5030-ND 23-1100 [NO DIODE]	SAME	090-5062-ND 23-1500 [NO DIODE]	Not Used
Guy™ **	2 Mini	090-5046-01-ND 27-950 [NO DIODE]	SAME		
Spider- Man TM **	3	090-5032-ND 22-1080 [NO DIODE]	SAME	Not Used	090-5032-ND 22-1080 [NO DIODE]



Flipper Coil Table ‡ ††

Flipper Coil Table ‡ ††										
GAME NAME	Nº of	FLIPPERS W/E		FLIPPERS no E.O.S. Swit SPI Nº / GAUGE-TURNS / Color						
GAME NAME	Flippers	9PI № / GAUGE LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT					
Laser War ‡	2	090-5011-00 22-750 / 30-2600	SAME	Not Used	Not Used					
Secret Service ‡	3	090-5006-00 23-620 / 30-2600	SAME	Not Used	090-5006-00 23-620 / 30-2600					
Torpedo Alley ‡	3	090-5011-00 22-750 / 30-2600	090-5013-00 23-700 / 30-2600	Not Used	090-5012-00 23-800 / 30-2600					
Time Machine ‡	2	090-5011-00 22-750 / 30-2600	SAME	Not Used	Not Used					
‡ These coils are dual-wound.										
Playboy 35th Anniversary ††	2	090-5020-02 22-900 -YEL-YEL-	SAME	Not Used	Not Used					
ABC Monday Night Football ††	2	090-5020-02 22-900 -YEL-YEL-	SAME	Not Used	Not Used					
†† A very small % of these games used	090-5020-20	coil which used a proto-type Solid	d State Flipper System. The two	types of coils both are 22-900 co	ls; the only difference is the					
Robocop	2 coils which	2 090-5020-20 SAME 22-900 -YEL-YEL-		Not Used	Not Used					
Phantom of the Opera	2	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used					
Back to the Future	2	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used					
The Simpsons	2	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used					
Checkpoint	2	090-5020-20 22-900 -YEL-YEL-	SAME	Not Used	Not Used					
Teenage Mutant Ninja Turtles	2	090-5020-30 23-900 -GRN-GRN-	SAME	Not Used	Not Used					
Batman	2	090-5020-30 23-900 -GRN-GRN -	SAME	Not Used	Not Used					
Star Trek 25th Anniversary	2	090-5020-30 23-900 -GRN-GRN-	SAME	Not Used	Not Used					
Hook	2	090-5030-00 23-1100 -ORG-ORG-	090-5020-30 23-900 -GRN-GRN-	Not Used	Not Used					
Lethal Weapon 3	2	090-5030-00 23-1100 -ORG-ORG-	SAME	Not Used	Not Used					
Star Wars	2	090-5032-00 22-1080 -YEL-GRN -	SAME	Not Used	Not Used					
Rocky & Bullwinkle & Friends	2	090-5020-30 23-900 -GRN-GRN -	SAME	Not Used	Not Used					
Jurassic Park	3	090-5020-30 23-900 -GRN-GRN -	SAME	Not Used	090-5030-00 23-1100 -ORG-ORG-					

Table continued on the next page.



APPENDIX E

Flipper Coil Table †

	Nº of	FLIPPERS w/E		FLIPPERS no E.O.S. Switch SPI Nº / GAUGE-TURNS / Color					
GAME NAME	Flippers	SPI Nº / GAUGE	•						
	_	090-5020-30	LOWER RIGHT	UPPER LEFT	UPPER RIGHT				
Last Action Hero	2	23-900 -GRN-GRN-	SAME	Not Used	Not Used				
Tales from the Crypt	3	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	090-5041-00 25-1800 -BLU-GRN-				
The Who's Tommy	3	090-5020-30 23-900 -GRN-GRN-	SAME	090-5041-00 25-1800 -BLU-GRN-	Not Used				
WWF Royal Rumble	4	090-5032-00 22-1080 -YEL-GRN-	SAME	090-5041-00 25-1800 -BLU-GRN-	SAME				
Guns N' Roses	3	090-5032-00 22-1080 -YEL-GRN-	SAME	090-5030-00 23-1100 -ORG-ORG-	Not Used				
Maverick	3	090-5032-00 22-1080 -YEL-GRN	SAME	Not Used	090-5032-00 22-1080 -YEL-GRN-				
Mary Shelley's Frankenstein	3	090-5030-00 23-1100 -ORG-ORG-	SAME	Not Used	090-5030-00 23-1100 -ORG-ORG-				
Baywatch	4	090-5030-00 23-1100 -ORG-ORG-	090-5020-30 23-900 -GRN-GRN-	090-5025-00 24-1570 -See Note-	090-5030-00 23-1100 -ORG-ORG-				
Batman Forever	3	090-5032-00 22-1080 -YEL-GRN -	090-5020-20 22-900 -YEL-YEL-	Not Used	090-5020-30 23-900 -GRN-GRN-				
Apollo 13	2	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	Not Used				
Golden Eye	2	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	Not Used				
Twister	2	090-5020-20 22-900 -YEL-YEL-	090-5032-00 22-1080 -YEL-GRN-	Not Used	Not Used				
ID4: Independence Day	3	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	090-5020-30 23-900 -GRN-GRN-				
Space Jam †	2	090-5032-00T 22-1080 -YEL-GRN-	090-5020-20T 22-900 -YEL-YEL-	Not Used	Not Used				
The Star Wars Trilogy - Special Edition †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used				
The Lost World: Jurassic Park †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used				
The X-Files †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used				
Starship Troopers †	3	090-5030-00T 23-1100 -ORG-ORG-	SAME	Not Used	090-5032-00T 22-1080 -YEL-GRN-				
Viper Night Drivin' †	2	090-5030-00T 23-1100 -ORG-ORG-	SAME	Not Used	Not Used				
Lost In Space †	2	090-5030-00T 23-1100 -ORG-ORG-	090-5032-00T 22-1080 -YEL-GRN-	Not Used	Not Used				
Godzilla †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used				
South Park †	2	090-5030-00T 23-1100 -ORG-ORG-	SAME	Not Used	Not Used				
Harley-Davidson® † and Harley-Davidson® 2nd Ed. †	2	090-5032-00T 22-1080 -YEL-GRN -	090-5030-00T 23-1100 -ORG-ORG-	Not Used	Not Used				
Striker Xtreme (NFL) †	3	090-5032-00T 22-1080 -YEL-GRN-	090-5030-00T 23-1100 -ORG-ORG-	090-5030-00T 23-1100 -ORG-ORG-	Not Used				
Sharkey's Shootout †	3	090-5030-00T 23-1100 -ORG-ORG-	SAME	090-5030-00T 23-1100 -ORG-ORG-	Not Used				
High Roller Casino †	2	090-5020-20T 22-900 -YEL-YEL-	090-5032-00T 23-1080 -YEL-GRN-	Not Used	Not Used				
Austin Powers™ †	2	090-5020-30 23-900 -GRN-GRN-	090-5030-00T 23-1100 -ORG-ORG-	Not Used	Not Used				
MONOPOLY® †	3	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	090-5062-00T 23-1500 -BLU-BLU-				
Playboy †	2	090-5030-00T 23-1100 -ORG-ORG-	SAME	Not Used	Not Used				
RollerCoaster Tycoon TM †	4	090-5032-00T 22-1080 -YEL-GRN-	SAME	090-5067-00T 25-1400 -RED-RED-	090-5068-00T 25-1600 -WHT-WHT				
	6* (5 with	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	090-5030-00T 23-1100 -ORG-ORG-				
The Simpsons™ Pinball Party †	Flipper	* The Homer Head Ass Upr. Rt. Style Flipper		Flippers (Mini-Bats) o 090-5041-00T	n 2nd Level Playfield:				
	Bats)	Upr. Rt. Style Flipper (no E.O.S. Switch):	* 090-5020-20T 22-900 -YEL-YEL-	090-5041-001 25-1800 -BLU-GRN-	090-5025-00T 24-1570 -See Note-				
Terminator® 3: Rise of the Machines™ †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used				
The Lord of the Rings TM †	2	090-5020-20T 22-900 -YEL-YEL-	SAME	Not Used	Not Used				
Ripley's Believe It or Not!® †	3	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	090-5067-00T 25-1400 -RED-RED-				

[†] Coil Part Nos ending with a "T" signifies the Diode is on the top of the lug (on the coil-winding side); Coil Part Nos ending with a "B" signifies the Diode is on the bottom of the lugs.





APPENDIX F Motor Specification (White Star Board System* Only) Table



Game Name	Function	Specifications	Part Numer
	Rocket	Bowman Motor 24VAC	515-6383-00
Apollo 13	Up/Down Movement Moon Unit	60Hz 3W 6 RPM CCW Multi Products Motor 24VAC	incl. Connector 515-6487-00
•	Rotational Orbit Shaker	50/60Hz 3W 6 RPM CCW Johnson Motor (Vibrator) 10.5VDC	incl. Connector 041-5029- 00
Colden Fire	Satellite	10 AMP 2950 RPM CW Bowman Motor 24VAC	MOTOR ONLY 515-6528-00
Golden Eye	Left/Right Movement Spinning Disc	60Hz 3W 6 RPM CW Multi Products Motor 24VAC (041-5026-00)	incl. Connector 515-6347-00
Twister	with Magnet	50/60Hz 3W 325 RPM CCW	incl. Connector
	Backbox Fan (Tornado Wind)	Multi Products Motor 24VAC (041-5052-00) 50/60Hz 3W 3600 RPM CW	515-6531-00 incl. Connector
ID4: Independence Day	Alien Head Open/Close Movement	Servo Motor <i>(94322)</i>	041-5045-00 MOTOR ONLY
SPACE JAM (NO MOTOR USED) The Star Wars Trilogy - S.E.	X-Wing	Bowman Motor 24VAC (041-5058-00)	515-6383-01
THE Stat Wats THIOGY - S.E.	Left/Right Movement Snagger & Center Link	60Hz 3W 10 RPM CCW Multi Products Motor 20VDC (041-5059-03)	<u>incl. Connector</u> 515-6715-03
The Lost World: Jurassic Park	Lift Up/Down Movement	9 RPM Non-Directional	incl. Connector
ourussis i urk	Shaker	Johnson Motor (Vibrator) 10.5VDC 10 AMP 2950 RPM CW	041-5029- 00 <i>MOTOR ONLY</i>
The X-Files	X-File Cabinet Lift Up/Down Movement	Multi Products Motor 20VDC 9 RPM CCW	041-5057-00 <i>MOTOR ONLY</i>
Starship Troopers	Warrior Bug Forward/Reverse Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W (041-5062-00), Series 36000: 1.4"ø (Non-Captive Shaft not included) HSI #36864-12 (Unipolar) Travel per Step: .004 Step Angle: 15°	515-6794-00 incl. Connector Requires 7" Shaft: 530-5503-00
VIPER NIGHT DRIVIN' (NO MOTOR USE	T'		
Lost In Space	Spinning Disc with Magnet	Multi Products Motor 24VAC (041-5046-00) 50/60Hz 3W 325 RPM CCW	515-6347-00 incl. Connector
Godzilla	Shaker ‡	Multi #3811 0630 Motor (Vibrator) 12VDC 3100 RPM CW (w/DRL PTS) ‡	041-5029 -01 <i>MOTOR ONLY</i>
SOUTH PARK (NO MOTOR USED)	Challey *	Multi #3811 0630 Motor (Vibrator) 12VDC	041-5029 -01
Harley-Davidson® 1st through 3rd Editions	Shaker ‡ Motorcycle	3100 RPM CW (w/DRL PTS) ‡ Autotrol 24VAC (041-5072-02)	MOTOR ONLY 515-7025-00
	Lift Up/Down Movement	20 RPM CCW	incl. Connector
Striker Xtreme (NFL)	Goalie (Linebacker) Left to Right Movement	Multi #3590 12VDC <i>(041-5075-00)</i> 60 RPM	515-7071-00 incl. Connector
Sharkey's Shootout	Mystery Ball Rotating Movement	Hankscraft Motor Model-E 24VAC (041-5076-00) 50/60Hz 3W 20 RPM CW	515-7095-00 incl. Connector
	Roulette Wheel Rotating Movement	Multi Products Motor 20VDC (041-5078-00) 17 RPM CCW	515-7153-00 incl. Connector
High Roller Casino	Up/Dn. Ramp in Slot Mach. Lift Up/Down Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W (041-5062-00), Series 36000: 1.4*ø (Non-Captive Shaft not included) HSI #36864-12 (Unipolar) Travel per Step: .004 Step Angle: 15°	515-6794-00 <u>incl. Connector</u> Requires Shaft 4 ¹ / ₄ ": 530-5503-01
	Time Machine Rotating Movement	Multi Products Motor 24VAC (041-5079-00) 50/60Hz 20RPM CCW	515-7141-00 incl. Connector
Austin Powers™	Laser Beam Left to Right Directional	Autotrol Motor 24VAC (041-5081-00) 50/60Hz 4W 10RPM Bi-Directional	515-7171-00 incl. Connector
	Dr. Evil Target Lift Up/Down Movement	Hankscraft Motor Model-E 24VAC (041-5030-00) 50/60Hz 6RPM CCW	515-5900-00 incl. Connector
Monopoly®	Mini-Flipper (Waterworks) Rotating Movement	Multi Prod. Motor & Gear Box #7000 EX00159A 20VDC 50/60Hz 85RPM CC/CCW	041-5083-00
	Triangular Billboard Rotating Movement	Autotrol Motor (BD511 150-1387) 24VAC 50/60Hz 12RPM Bi-Directional	MOTOR ONLY 041-5086-02 MOTOR ONLY
Disabase	Centerfold Mechanism Open/Close Movement	Multi Products (3680) Motor 12v DC 10/12 RPM CC/CCW	041-5075-04
Playboy	Tease Drop Screen Lift Up/Down Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W (041-5062-00), Series 36000: 1.4"ø (Non-Captive Shaft not included) HSI #36864-12 (Unipolar) Travel per Step: .004 Step Angle: 15°	MOTOR ONLY 515-6794-00 incl. Connector Requires 7" Shaft: 530-5503-00

"-01" Shaker Motor is **Not Compatible** with old Shaker Motor 041-5029-**00** (Shaker Motor Assy. 515-5893-00).
THIS NEW MOTOR CAN ONLY BE USED IN NEW SHAKER MOTOR ASSY. 515-5893-**01**. **Table continued on the next page.** ‡ Please Note:

Appendix F:

Motor Specification Table





Motor Specification (White Star Board System* & S.A.M. System** Only) Table



Game Name	Function	Specifications	Part Number							
	ROLLERCOASTER TYCOON™ (NO MOTOR USED) THE SIMPSONS™ PINBALL PARTY (NO MOTOR USED) To write the simple of the si									
Terminator® 3: Rise of the Machines™	Backbox Ball Shooter Up/Down Movement	Multi Products Motor 24VAC (041-5079-01) 21 RPM CW	515-7317-00 incl. Connector							
The Lord of the Rings™	Balrog (Motor & Gate) Open/Close Movement	Multi Prod. Motor 20VDC Series 600B (or equiv.) 50/60Hz 10 RPM Bi-Directional	041-5088-01 MOTOR ONLY							
RIPLEY'S BELIEVE IT OR NOT!® (NO M	OTOR USED)									
Elvis®	Elvis™ Front/Back Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 10W (041-5089-00), (Non-Captive Shaft not included) HSI #46868-12-002	500-6809-00 <u>incl. Connector</u> Requires 7.25" Shaft: 530-5658-00							
	Shaker	Multi #3811 0630 Motor (<i>Vibrator</i>) 12VDC (041-5029- 01) 3100 RPM (w/DRL PTS)	515-5893-01 incl. Connector							
The Sopranos ^{sм}	Bada Bing! Girls x2 Rotating Posts Movement	Autotrol Synchronous Motor 24VAC 4W 50/60Hz 45.7/54.9 RPM Bi-Directional	041-5092-00 w/1" Shaft + 12" Leads							
NASCAR® and [NDSE]	Back Panel Rotating (Car) Windmill (Skill Ball Enter)	Multi Products Motor & Gear Box 20VDC Model #8000 (EX-04-073) 10 RPM	041-5093-00 MOTOR ONLY							
Grand Prix	Back Panel Rotating (Car) Windmill (Skill Ball Enter)	Multi Products Motor & Gear Box 20VDC Model #8000 (EX-04-073) 10 RPM	041-5093-00 MOTOR ONLY							
World Poker Tour™ (WPT) (NO MOTOR	USED)									
	Bart on Skateboard Left/Right Movement	Multi Products Motor with Crank 24VAC (041-5095-01) 50/60Hz 3W 14 RPM	500-6947-01 incl. Connector							
The Simpons™ Kooky Carnival	Left & Right Ramps Up/Down Movement	Multi Products Motor 24VAC (041-5048-01) 50/60Hz 3W 15 RPM CCW (Qty. 2 in game)	515-7558-00 incl. Connector							
	Shaker (details in SKC Manual, Page 24)	Multi #3811 0630 Motor (<i>Vibrator</i>) 12VDC 3100 RPM (w/DRL PTS)	041-5029 -01 MOTOR ONLY							
©Disney's Pirates of the Caribbean	Spinning Disk	Multi #3811 R 0630 Motor (Vibrator) 12VDC (041-5029- 04) 3100 RPM (w/DRL PTS) -04 is RoHS compliant; can substitute with -01 domestic	511-5024-04 incl. Connector							
of the Cambbean	Pirate Ship Sinking/Raising Movement	Multi Products Motor & Gear Box 24VDC Model #7000-DCM 12 RPM	041-5101-00 MOTOR ONLY							
Family Guy™	Stewie Figurine Left & Right Movement	Stepper Motor NPM PF35T-48D4STD 5V RVB (041-5102-00 Reference Only)	511-5043-00 incl. Connector							
Outles Manager	Doc Ock, Sandman & 3-Bank Up/Down Movement	Sync. Motor 24VAC 50/60Hz 3W 12 RPM CW (041-5103-00 Reference Only)	511-5063-00 incl. Connector							
Spider-Man™	►►► OPTIONAL ◀◀◀ Shaker Motor Kit 502-5027-00	Multi #3811 R 0630 Motor (<i>Vibrator</i>) 12VDC (041-5029- 04) 3100 RPM (w/DRL PTS) -04 is RoHS compliant; can substitute with -01 domestic	515-5893-01 incl. Connector							



APPENDIX F

Motor Specification Table

The following table only list games that	used motors. Part Num	bers starting with "515-" will include the Wiring F	larness & Connector.
Game Name	Function	Specifications	Part Nº
ABC Monday Night Football	Goal Post Up/Down Movement	Motor 24v A.C. 60 RPM CW	515-5222-00
Phantom of the Opera	Organ Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Checkpoint	Mag Wheel (in Backbox)	Motor D.C. (KEN)	041-5005-00
Спескропп	Shaker	Johnson Motor (Vibrator)	041-5002-00
Teenage Mutant Ninja Turtles	Spinning Pizza Ball Deflector	Gear Motor 24v A.C. 325 RPM CW	515-5397-00
Batman	Bar Target Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
	Swinging Target	Bowman Motor 24v 22½ RPM	515-5534-00
Star Trek 25th Anniversary	Transporter F/X	Gear Motor 24v A.C. 3½ RPM	500-5421-00
	Cooling Fan (for Transporter F/X)	4½" Motor 12v	041-5014-00
Lethal Weapon 3	Spinning Light	Motor 2½ v A.C. 4000 RPM CCW	041-5017-00
	Bar Target Up/Down Movement	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
Star Wars	R2D2 Robot Left/Right Movement	Bowman Motor 24v A.C. 22½ RPM CW	515-5571-00
	Death Star Rotation	Bowman "G" Motor 24v A.C. 60Hz 6 RPM CW	515-5570-00
Rocky & Bullwinkle & Friends	Nell Log "Cutting Blade" Forward/Back Movement	Autotrol Model E Motor 24v 60hz 4W 3 RPM CCW	041-5023-00
	T-Rex Left/Right Movement	Multi Motor 5v D.C.	041-5025-00
Jurassic Park	T-Rex Up/Down Movement	Bowman Motor 24v 11 RPM CW	041-5026-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Last Action Hero	Crane Left/Right Movement	Multi Products Motor 12v D.C. #3312 OSC	041-5027-00
Lust Addon Horo	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Tales from the Crypt	Tombstone Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
Tales from the Orypt	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
	Mirror Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
The Who's Tommy	Flipper Blinders	Servo Motor (94102)	041-5032-00
	Spinning Airplane Propellers	Motor D.C.	041-5033-00
WWF Royal Rumble	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Maverick, The Movie	Turning Paddle Wheel	Motor 24v A.C. 10 RPM	041-5036-00
Mary Shelley's Frankenstein	Creature Head Left/Right Movement	Servo Motor (94102)	041-5032-00
Batman Forever	Cannon Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00



APPENDIX G

Part Number Prefix Classification Codes

l.	010- 031-	cal Source, Energy & Signal Converters Transformers Speakers Solonoida (Coile)	VI.	355-	s, Locks, Catches, Latches, Keys Handles, Locks, Catches, Latches and Keys
	090- 150- 200-	Solenoids (Coils) Filters, Outlets, Varistors, Thermistors Fuses	VII.	390- 501-	ted Parts Hinges Coin Doors
II.	Conduction (Conduction Conduction	Ctors, Connectors & Insulators Line Cords Cable Assemblies & Wiring Harnesses Motors Connectors (All Types) Lugs (M/F), Pins (M/F), Discs, Ring Terminals, Terminal Strips, etc. Polarizing Keys and Conn. Covers Lamp Sockets		520- 522- 525- 530- 535- 545-	Sub-Assemblies Printed Circuit Boards (PCBs) Display Glass Wood Parts Screw Machined Parts Fabricated Parts Molded (Extruded) Plastic and Rubber Parts (Rings, Sleeves, etc.) Molded (Inserts)
III.		s & Circuit Elements ICs Transistors Diodes (All Types including LEDs & Modules) Resistors Resistors (Variable & Adjustable) Regulators & Bridge Rectifiers Capacitors (Radial Lytics & Ferrites)	VIII.	500- 502- 505- 510- 511- 515-	e Assemblies End Product (Systems and Models) Kits (Created In-House) Cabinets (complete) Riveted Sub-Assemblies (In-House) Sub-Assemblies (In-House) Sub-Assemblies* *2 or more 515-'s but still a sub-assembly.
	126- 127- 130- 140- 165- 180- 181- 190- 960- 965-	Piezo Crystal Heatsinks Capacitors (Tecates & Ceramics) Oscillators (Clocks/Crystals) Light Bulbs Switches Switch Membranes (Pads) & Piezo Sensors Relays EPROM (Raw Part) EPROM (Programmed Part)	IX.	601- 602- 604- 605- 625- 626-	Aterials Braided Wire & Ground Straps Stranded Wire Ribbon Cable Telephone Line Cord Sleeving (Shrink Tubing) Velcro (non-adhesive) Foam Rubber, Foam Pads, Rubber Bumpers (Blue Pads), Tape (All Types) Velcro (adhesive) and String / Rope
IV.	Bolts, \$231-232-234-237-240-242-244-245-246-281-	Screws, Nuts, Washers & Nails Bolts Screws (Pan Head) Screws (HWH) Screws (Misc.) Nuts (Misc.) Washers (Flat, Round) Washers (Split Lock) Nyliners Washers (Lockers, External Tooth) Nails	X.	040- 042- 091- 205- 631- 660- 675- 705- 755-	Tools (see also 777-) and Supplies Clamps, Ties & Clips Pulleys Coin Mechs Fuse Holders Staples Glass (Playfield, Backglass, etc.) Cleaners Packing & Shipping Items Instruction, Coin Cards, Ins. Sheets
V.	Mechai 249- 251- 254- 260- 265- 266- 267- 269- 270- 280- 283-	Rivets Pins (Dowel), Finishing Nails, Hairpins, Spring Pins and Clevis Pins Stand-Offs, Spacers and Shims Steel Ball (All Types Steel, Glowing, Delrin, etc.) Springs (Extension) Springs (Compression) Springs (Torsion) Springs (Washers - Belleville, Wave) Retaining Rings Grommets, Bushings and Nyliners Bearings		777- 780- 802- 820- 803- 830- 880- 900-	Information Sheets, Service Bulletins, Instruction Sheets in Kits and Templates Tools (Wrenches and Drivers) Manuals Decal Kits (comprised of 820's) Decals, Mylar and Labels (Sheets/Sets) Plastic Kits (comprised of 830's) Plastic Pieces (Butyrate Sheets/Sets) Toys, Models, Figurines, etc. Game Posters

Appendix G:



APPENDIX H

Playfield Inserts (Plastic Light Covers)

Patterns: STARBURST	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR
STIPPLE	5/8" Ø	3/4" Ø	1" ø	1-3/ ₁₆ " Ø	1-1/2" Ø
	550-5000-XX	550-5001-XX	550-5002-XX	550-5003-XX	550-5004-XX
STARBURST CIRCULAR	STARBURST CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR
2-1/4" Ø	2-3/4" Ø	3/4" Ø	1" Ø	1-3/ ₁₆ " Ø	1-½" ø
550-5005-XX	550-5006-XX	550-5007-XX	550-5008-XX	550-5009-XX	550-5010-XX
PLAIN CIRCULAR	PLAIN CIRCULAR	STIPPLE CIRCULAR	STIPPLE 1" SQUARE	ROLLOVER BUTTON BASE	WHITE STAR (only in white)
2-1/4" Ø	2-3/4" Ø	1" Ø	12"		
550-5011-XX	550-5012-XX	550-5048-XX	550-5019-XX	550-5026-XX	545-5015-00
STIPPLE RECTANGULAR	STIPPLE RECTANGULAR	STARBURST RECTANGULAR	PLAIN RECTANGULAR	PLAIN RECTANGULAR	PLAIN RECTANGULAR
1-1/2" X 3/4"	1-5/8" X 1-1/2"	2-1/4" X 1-1/8"	2-1/4" X 1-1/8"	1-1/4" X 1-1/2"	2" X 2-½"
1-1/2" X 3/4" 550-5018-XX	1-5/8" X 1-1/2" 550-5051-XX	2-1/4" X 1-1/8" 550-5044-XX	2-1/4" X 1-1/8" 550-5049-XX	1-1/4" X 1-1/2" 550-5050-XX	2" X 2-½" 550-5063-XX
1-1/2" X 3/4"	1-5/8" X 1-1/2"	2-1/4" X 1-1/8"	2-1/4" X 1-1/8"	1-1/4" X 1-1/2"	2" X 2-½"
1-1/2" X 3/4" 550-5018-XX STARBURST	1-5/8" X 1-1/2" 550-5051-XX STARBURST	2-1/4" X 1-1/8" 550-5044-XX	2-1/4" X 1-1/8" 550-5049-XX BEVEL	1-1/4" X 1-1/2" 550-5050-XX PLAIN	2" X 2-½" 550-5063-XX
1-1/2" X 3/4" 550-5018-XX STARBURST MINI SHIELD 1" X 1" 550-5024-XX	1-5/8" X 1-1/2" 550-5051-XX STARBURST LARGE SHIELD 550-5025-XX	2-1/4" X 1-1/8" 550-5044-XX MINI HOT DOG	2-1/4" X 1-1/8" 550-5049-XX BEVEL HOT DOG	1-1/4" X 1-1/2" 550-5050-XX PLAIN HOT DOG 3-1/2"	2" X 2-½" 550-5063-XX
1-½" X ¾" 550-5018-XX STARBURST MINI SHIELD 1" X 1"	1-5/8" X 1-1/2" 550-5051-XX STARBURST LARGE SHIELD	2-1/4" X 1-1/8" 550-5044-XX MINI HOT DOG 1-5/8"	2-1/4" X 1-1/8" 550-5049-XX BEVEL HOT DOG 3-1/2"	1-1/4" X 1-1/2" 550-5050-XX PLAIN HOT DOG 3-1/2"	2" X 2-1/2" 550-5063-XX BANANA
1-1/2" X 3/4" 550-5018-XX STARBURST MINI SHIELD 1" X 1" 550-5024-XX STARBURST	1-5/8" X 1-1/2" 550-5051-XX STARBURST LARGE SHIELD 550-5025-XX STARBURST	2-1/4" X 1-1/8" 550-5044-XX MINI HOT DOG 1-5/8" 550-5020-XX STARBURST ARROW-HEAD	2-1/4" X 1-1/8" 550-5049-XX BEVEL HOT DOG 3-1/2" 550-5021-XX STARBURST ARROW-HEAD	1-1/4" X 1-1/2" 550-5050-XX PLAIN HOT DOG 3-1/2" 550-5022-XX STARBURST	2" X 2-½" 550-5063-XX BANANA 550-5023-XX STARBURST

Note: The shapes and sizes shown above are not to scale. Some shapes may no longer be available in every color.

Instructions:

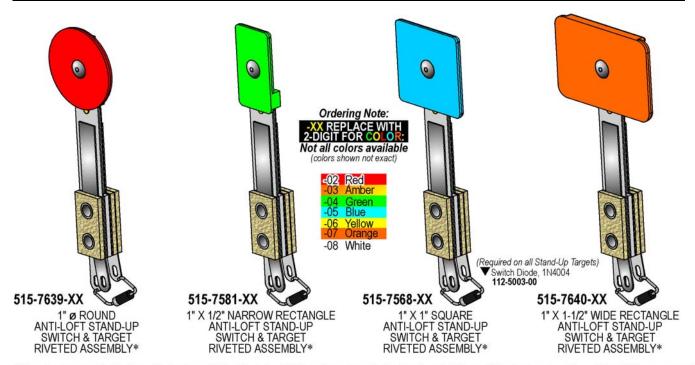
Parts which may come in various colors (i.e. targets, some posts, playfield inserts, etc.) end in a 2-digit number which correspond to the color of that part. The "-XX" in part number which may come in various colors should be replaced with the desired 2-Digit number corresponding to the color desired below. Not all colors may be available.

	PLASTIC PART COLOR CHART												
Nº Color № Color № Color № Color № Color № Color										Color			
-00	Black or Solid Clear	-03	Amber	-06	Yellow	-09	Purple	-12	Fluor. Blue	-15	Luminescent		
-01	Clear	-04	Green	-07	Orange	-10	Fluor. Orange	-13	Teal Green	-16	Gold		
-02	Red	-05	Blue	-08	White	-11	Fluor. Green	-14	Gray	-17	Trans. Brown		

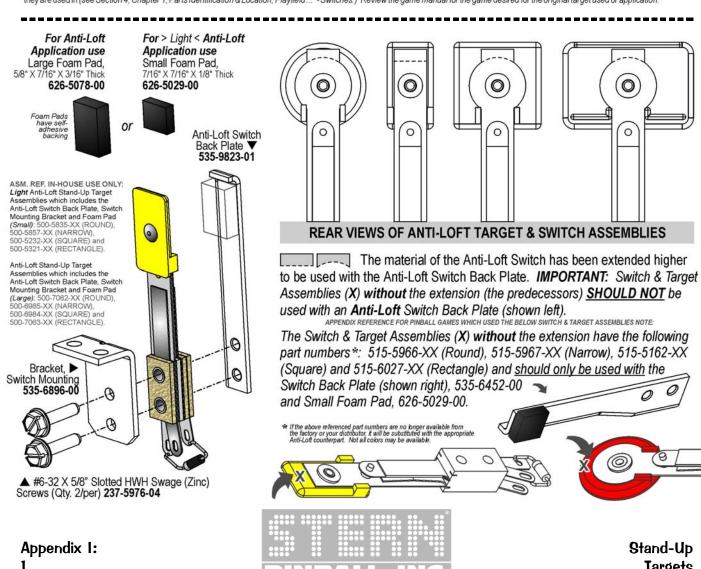


APPENDIX I

Anti-Loft Stand-Up Targets

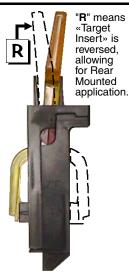


^{*}Some targets may require the lugs position be changed to the left or to the right, depending on the application; these targets will have a different part number and are called out in the game manual they are used in (see Section 4, Chapter 1, Parts Identification & Location, Playfield... - Switches.) Review the game manual for the game desired for the original target used or application.



APPENDIX I

Modular Stand-Up Targets















-XX F 2-DIG	REPLACE WITH IT FOR COLOR:
-00	Black
-N1	Clear
-02	Red Amber Green Blue
-03	Amber
-04	Green
-05	Blue
-06	Yellow
-07	Orange
-08	White
-09	Purple
-10	Fluor. Orange
-11	Fluor. Green
-12 -13	Fluor. Blue Teal Green
-13	Gray
-15	Gray Luminescent
-16	Gold
	ot all colors available

To Replace the « Target Insert » or change Target Orientation:

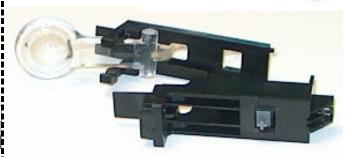
Items A-E Note: For the Target Assembly use the "500-" SPI Part Number(s) shown in the Parts Table below. To receive the Target Assembly with the « Target Insert » « Reversed » simply add a "R" at the end of the Part Number. See Side View picture left to compare (dashed line shows target reversed). For just the «Target Insert» use the "545-" SPI Part Number.



To reverse it yourself or to just change the insert:

1. With a small flat head screwdriver, push into the small tab at the bottom of the target front and give a slight twist motion to "pop" the two halves.

2. Push the Target Insert bottom in at the same time while you slide the top (front) part up, then let go of the insert as the two halves come apart.



3. Replace target or reinsert it into the other size while sliding the two halves back together.

Note: If you were reversing the orientation, don't forget to also turn the Switch Actuator PCB 180°. Test Switch.

Take Note:

Items A-E come in various colors. These targets may not be available in every color. The "-XX" in should be replaced with the desired 2-Digit number for the color desired as described in the Color Chart below. As of print date, the following colors were used:

-01 Clear (A, D); -02 Red (A, B, C, D, E); -03 Amber (D, E); -04 Green (A, B); -05 Blue (C); -06 Yellow (A, C),
-09 Purple (B, D); -11 Fluorescent Green (A, B, D)
2. For location(s) and type of Stand-Up
Targets used, if any, see Section 4, Chapter 1,
Parts Identification & Location.

Nr.	STAND-UP TARGET PARTS	SPI PART Nr.
Α	Modular Stand-Up Target Narrow Assy.	500-6138-XX
	Stand-Up Target Narrow (Insert)	545-6138-XX
	Modular Stand-Up Target Square Assy.	500-6139-XX
В	Stand-Up Target Square (Insert)	545-6139-XX
С	Modular Stand-Up Target Rectangle Assy.	500-6228-XX
	Stand-Up Target Rectangle (Insert)	545-6228-XX
_	Modular Stand-Up Target Round Assy.	500-6075-XX
D	Stand-Up Target Round (Insert)	545-6075-XX
_	Mod. Stand-Up Target 1" Spherical Assy.	500-6189-XX
	Stand-Up Target 1" Spherical (Insert)	545-6189-XX

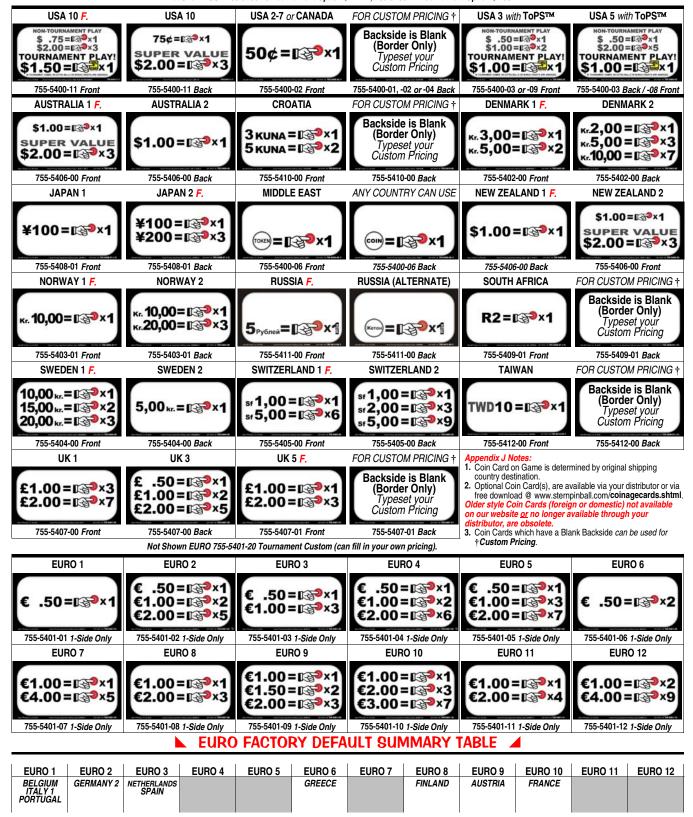




APPENDIX J

Coin Cards (USA & International Pricing Defaults) ▶ For Yellow Stock add -Y to the Part Number

If more than one Pricing Scheme is available for countries listed, the **F.** listed beside the option, denotes the Factory Default Setting. **FOR VIEWS OF THE LATEST or OPTIONAL USA, INTERNATIONAL / EURO AND CUSTOM COIN CARDS, VISIT OUR WEBSITE.**Not Shown USA 755-5400-10 Tournament Option \$2 = X1; 755-5400-11 Tournament Option \$1.50 = X1



Section 3, Chapter 4, GO TO ADJUSTMENTS MENU, Adj. 18, Game Pricing, USA & International (non-Euro) and Euro 1-12 Summary & International (Euro) Standard Pricing Select Tables, summarizes Standard or Custom Pricing Schemes & the Dip Switch Setting required.









SWITCH MENU: SWITCH, ACTIVE & DEDICATED

SWITCH MATRIX GRID & DEDICATED SWITCHES (for notes & locations, see Page DR. 4 or 17)

Column (Drive)	1: Q1	2: Q2	3: Q3	4: Q4	5: Q5	6: Q6	7: Q7	8: Q8	GROUND	GROUND
Row (Return)	GRN-BRN CN5-P1	GRN-RED CN5-P3	GRN-ORG CN5-P4	GRN-YEL CN5-P5	GRN-BLK CN5-P6	GRN-BLU CN5-P7	GRN-VIO CN5-P8	GRN-GRY CN5-P9	IC U206 INPUTS	BLK CN6-P1, -P11
1: U400	Cabinet Side	9		25 Below P/F	33 Above P/F	41	49 Below P/F	57 Below P/F	1: U206	DS-1 on Cabinet Side
WHT-BRN CN7-P9	BUTTON (UK ONLY)	NOT USED	TOP DROP TARGET	RIGHT ORBIT	LEFT SPINNER	NOT USED	LEFT BUMPER	LEFT OUTLANE	GRY-BRN CN6-P2	#1 LEFT FLIPPER BUTTON
Sw. Part Number:	180-5160-01 ´		180-5158-00	500-6227-02	180-5010-04	, , , , , , , , , , , , , , , , , , ,	180-5015-04	500-6227-01	Sw. Part Number:	180-5160-01
2: U400		10		26 Below P/F	34 Above P/F	42 Above P/F	50 Below P/F	58 Below P/F	2: U206	DS-2 Below Playfield
WHT-RED CN7-P8	4TH COIN SLOT	NOT USED	MIDDLE DROP TARGET	LEFT ORBIT	LOWER ACCELERATOR RIGHT (OPTO)	RIGHT SPINNER	RIGHT BUMPER	LEFT RETURN LANE	GRY-RED CN6-P3	#2 LEFT FLIPPER E.O.S (End-of-Stroke)
Sw. Part Number:	180-5204-00		180-5158-00	500-6227-02	See Sw. 34 Note	180-5010-04	180-5015-04	500-6227-02	Sw. Part Number:	180-5149-00 on Flipper
		Below P/F		27 Below P/F	35 Above P/F	43 Below P/F	51 Below P/F	59 Below P/F	3: U206	DS-3 on Cabinet Side
WHT-ORG CN7-P7	6TH COIN SLOT	4-BALL TROUGH #1 (LEFT)	BOTTOM DROP TARGET	PIT LOCK MIDDLE	LOWER ACCELERATOR MID. (OPTO)	RIGHT STANDUP	BOTTOM BUMPER	LEFT SLINGSHOT	GRY-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON
Sw. Part Number:	Future Use	180-5119-02	180-5158-00	180-5179-00	See Sw. 35 Note	500-5857-06	180-5015-04	180-5054-00 (x2)	Sw. Part Number:	180-5160-01
		12 Below P/F		28 Below P/F	36 Below P/F	44 Below P/F	52 Below P/F	60 Below P/F	4: U206	DS-4 Below Playfield
WHT-YEL CN7-P6	RIGHT COIN SLOT	4-BALL TROUGH #2	WINDMILL MOTOR OPTO	PIT LOCK TOP	TEST CAR STANDUP X2	CENTER STANDUP	GARAGE VUK	RIGHT OUTLANE	GRY-YEL CN6-P6	#4 RIGHT FLIPPER E.O.S. (End-of-Stroke)
Sw. Part Number:	180-5204-00	180-5119-02	See Sw. 20 Note	180-5178-00	515-5162-06	500-5857-06	180-5116-01	500-6227-02	Sw. Part Number:	180-5149-00 on Flipper
	5 Coin Door	13 Below P/F			37 Above/Below	45 Below P/F	53 In Cabinet	61 Below P/F	5: U206	DS-5
WHT-GRN CN7-P5	CENTER COIN SLOT / DBA	4-BALL TROUGH #3	LEFT RAMP MAKE OPTO	MIDWAY EJECT S	LOWER ACCELERATOR LEFT (OPTO)	LEFT STANDUP	SLAM TILT (OPT)	RIGHT RETURN LANE	GRY-GRN CN6-P7	NOT USED
Sw. Part Number:	180-5204-00	180-5119-02	See Sw. 21 Note	180-5116-01	See Sw. 37 Note	500-5857-06	180-	500-6227-01	Sw. Part Number:	
6: U401		14 Below P/F	22	30 Below P/F	Below P/F	46	54 In Cabinet	62 Below P/F	6: U206	DS-6 on Coin Door
WHT-BLU CN7-P3	LEFT COIN SLOT	4-BALL TROUGH VUK OPTO	NOT USED	TRACK POPPER S	CAPTIVE BALL STANDUP	NOT USED	START BUTTON	RIGHT SLINGSHOT	GRY-BLU CN6-P8	#6 VOLUME (RED BUTTON) (In Test: LEFT)
Sw. Part Number:	180-5204-00	See Sw. 14 Note		180-5116-01	500-5232-06		180-5174-00	180-5054-00 (x2)	Sw. Part Number:	<u>1</u> 80-5192-02
7: U401	7 Coin Door	15 Below P/F		31	39 Below P/F	Above P/F	55 In Cabinet	63	7: U206	DS-7 on Coin Door
WHT-VIO CN7-P2	5TH COIN SLOT	4-BALL STACKING OPTO	TRUCK RAMP KICKER	NOT USED	CAR MECH DOWN	UPPER ACCELERATOR TOP (OPTO)	START	NOT USED	GRY-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT)
Sw. Part Number:	Future Use	See Sw. 15 Note	180-5057-00	00 11 00 1	180-5201-00	See Sw. 47 Note	180-5174-00		Sw. Part Number:	180-5192-04
		16 Above P/F	Above P/F		40 Below P/F	48 Above/Below	56 In Cabinet	64	8: U206	DS-8 on Coin Door
WHT-GRY CN7-P1	BUTTON (UK ONLY)	SHOOTER LANE	RIGHT RAMP (TO) DIVERTER	PIT LOCK BOTTOM (OPTO)	TEST CAR	UPPER ACCELERATOR BOT. (OPTO)	PLUMB BOB TILT	NOT USED	GRY-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER)
Sw. Part Number:	180-5160-01	180-5200-00	180-5010-04	See Sw. 32 Note	180-5010-04	See Sw. 48 Note	See Sw. 56 Note		Sw. Part Number:	180-5192-00







LAMP MATRIX GRID (for notes & locations, see Page DR. 5 or 23)

Column (18v)	1: U17	2: U16	3: U15	4: U14	5: U13	6: U12	7: U11	8: U10
Row (Ground)	YEL-BRN J13-P9	YEL-RED J13-P8	YEL-ORG J13-P7	YEL-BLK J13-P6	YEL-GRN J13-P5	YEL-BLU J13-P4	YEL-VIO J13-P3	YEL-GRY J13-P1
1: Q33	1 #44 Clear Bulb	2 #555 Clear Bulb	3 #555 Clear Bulb	4 #555 Clear Bulb	5 #555 Clear Bulb	6 #555 Clear Bulb	7 #555 White LED	8 #555 Clear Bulb
RED-BRN J12-P1	RACE POSITION 10	VICTORY LAP	HAPPY HOUR*	100K	STANDUP LEFT	(R)ACE	LEFT POP	SPECIAL & MILLIONS
2: Q34	9 #555 Clear Bulb	10 #555 Clear Bulb	#555 Clear Bulb	12 #555 Clear Bulb	13 #555 Clear Bulb	14 #555 Clear Bulb	15 #555 White LED	16 #555 Clear Bulb
RED-BLK J12-P2	RACE POSITION 9	ROAD COURSE*	INFIELD PARTY	150K	100K	R(A)CE	RIGHT POP	GARAGE
3: Q35	17 #44 Clear Bulb	#555 Clear Bulb	19 #555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb		#555 Clear Bulb
RED-ORG J12-P3	RACE POSITION 8	2X HAULER MILES	SHORT TRACK*	200K	150K	RA(C)E	BOTTOM POP IS	FUEL
4: Q36	25 #555 Clear Bulb	#555 Clear Bulb	#44 Clear Bulb	#555 Clear Bulb	29 #555 Clear Bulb	30 #555 Clear Bulb	31 #44 Clear Bulb	32 #44 Yellow Bulb
RED-YEL J12-P4	RACE POSITION 7	COLLECT R-A-C-E	TEST CAR	250K	200K	RAC (E)	(C) HAMP #1	PIT ROAD SIGN
	#44 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	37 #555 Clear Bulb	38 #555 Clear Bulb	39 #44 Clear Bulb	40 #44 Clear Bulb
RED-GRN J12-P5	RACE POSITION 6	JACK POT	HAULER RIDE	HARD RACING	250K	SPIN	C (H) AMP #1	MOVE UP
6: Q38	41 #555 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	44 #555 Clear Bulb	45 #555 Clear Bulb	46 #555 Clear Bulb	47 #44 Clear Bulb	48 #555 Clear Bulb
RED-BLU J12-P6	RACE POSITION 5	BONUS JACKPOT	LIGHT EXTRA BALL	COLLECT R-A-C-E	SPEED SHOTS	JACK POT	CH (A) MP #1	CHAMP #1
7: Q39	49 #44 Clear Bulb	#555 Clear Bulb	51 #44 Clear Bulb	52 #555 Clear Bulb	53 #555 Clear Bulb	54 #555 Clear Bulb	55 #44 Clear Bulb	#555 Clear Bulb
RED-VIO J12-P8	RACE POSITION 4	MULTI BALL	BUMP 'N RUN*	JACK POT	COLLECT R-A-C-E	EXTRA BALL	CHA (M) P #1	SCANNER
8: Q40	#555 Clear Bulb	#555 Clear Bulb	59 #555 Clear Bulb	60 #44 Clear (X2)	#555 Clear Bulb	#555 Clear Bulb	#44 Clear Bulb	#555 Clear Bulb
RED-GRY J12-P9	RACE POSITION 3	LOCK	RIGHT SIDES ONLY*	SPINNERS X2 (@ MAX)	JACK POT	MODE BONUS	CHAM (P) #1	JACK POT
9: Q41	#44 Clear Bulb	#555 Clear Bulb	#555 Clear Bulb	68 #555 Clear Bulb	69 #555 Clear Bulb	70 #555 Clear Bulb	71 #44 Clear Bulb	72 #555 Clear Bulb
RED-WHT J12-P10	RACE POSITION 2	COLLECT R-A-C-E	SUPER FAN	TO GO	LEFT RAMP STANDUP (LEFT)	COLLECT R-A-C-E	CHAMP (#1)	SHOOT AGAIN
10: Q42	73 #555 Clear Bulb	#555 Clear Bulb	75 #555 Clear Bulb	76 #555 Clear Bulb	#555 Clear Bulb	78 #555 Clear Bulb	79 OPTIONAL	80 #555 Clear Bulb
RED J12-P11	RACE POSITION 1	JACK POT	GAS 'N GO*	1 TO GO	LEFT RAMP STANDUP (RT)	SUPER JACK POT	TOURNAMENT BUTTON	START BUTTON

▼ U.S. ▼ Customary Inch Ruler

ω



Technical Support & Parts Sales

2002, 2003 (2-Disc Set) & 2004 (2-Disc Set) CD-Roms are now available! Click year for more info!

We at STERN Pinball continuously strive to provide our distributors, operators, and game owners with the best technical support possible. We, therefore, have provided you with the service options listed below. If your game requires parts and/or service, please contact your nearest STERN Pinball distributor (See our <u>Distribution List</u>). For any additional assistance, contact our technical service staff at 1-800-KICKERS (1-800-542-5377) or by e-mail at <u>parts.service@sternpinball.com</u>.

If your STERN Pinball is in need of repair, please contact your nearest STERN Distributor.

Pinball Game Parts

Offering Service Game Manual excerpts: Parts Identification & Location, Drawings for Major Assemblies & Ramps and Appendixes A-J (updated with each game)

Service Bulletins

Detailing Technical Information, Tips, FYIs, Notices and Updates

ROM Code Library

Offering game code for all Data East®, SegaTM and STERN® Pinballs (EPROM Programmer required)

Coinage Cards

Detailing the Country Setting, Pricing Scheme and Dip Switch Setting

<u>Schematics</u>, <u>Theory of Operation</u> and Troubleshooting Tips

Drawings on the White Star Board SystemTM

Tricks & Tips

1st Time Pinball Set-Up / Prev. Maintenance

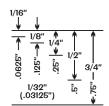
Track Your Order Via UPS

NTE Semi-Conductor Cross Reference

Radio Shack Component Catalogue

PINBALL, INC. PARTS SALES & TECHNICAL SUPPORT

Metric Conversion



1" = 2.54 cm or 25.4 mm 1 cm = .3937" 1 mm = .03937"

For metric, multiply the inch value by the metric value:

tample: 5" X 2.54 cm = 12.7 cm or 127 mm

For US, multiply the metric value by the inch value:

example: 13 cm X .3937" = 5.1181"

Visit our website www.sternpinball.com for Pinball & Redemption game information!

Click Tech Support 8 Parts Sales

to view, print or download all of the above!

HELP US, HELP YOU! If you have any suggestions, questions, need technical advice, find errors or have comments, contact us through our website or call!

This Game Service Manual and all other documents relating to this product, playfield components, features, rules, programming and operation are subject to change without notice (Service Bulletins, if applicable, available through our website).



 ∞

